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ELECTRICAL WORLD

APRIL 25, 1931
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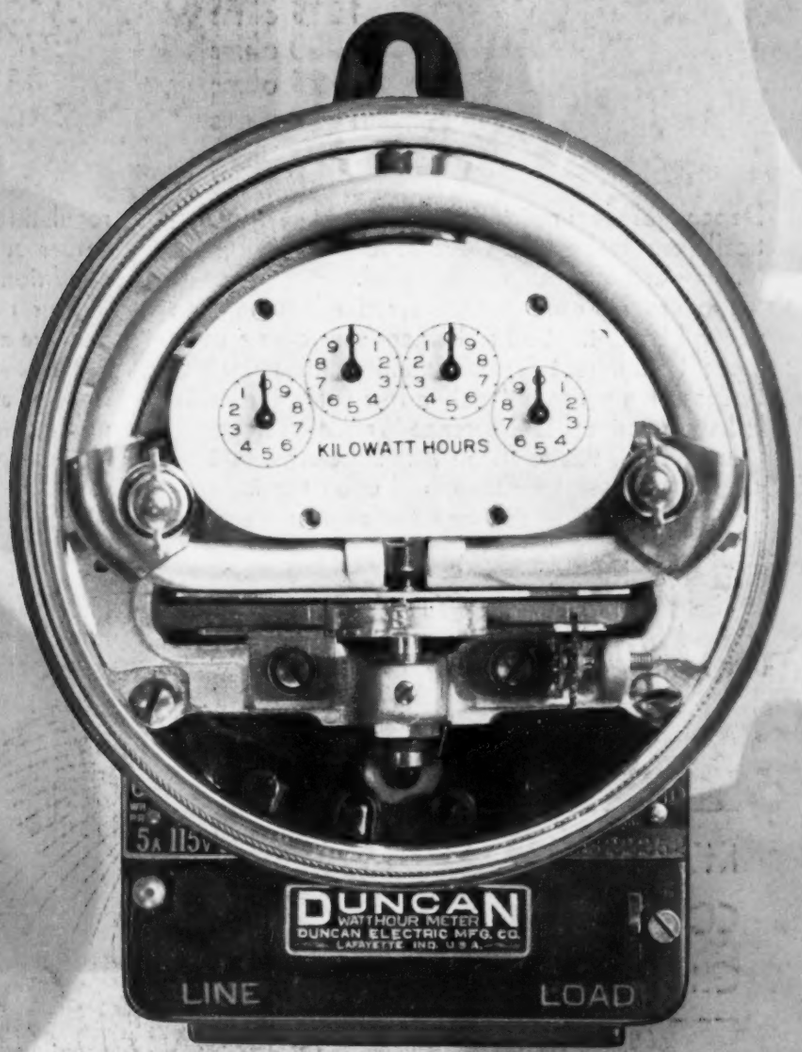

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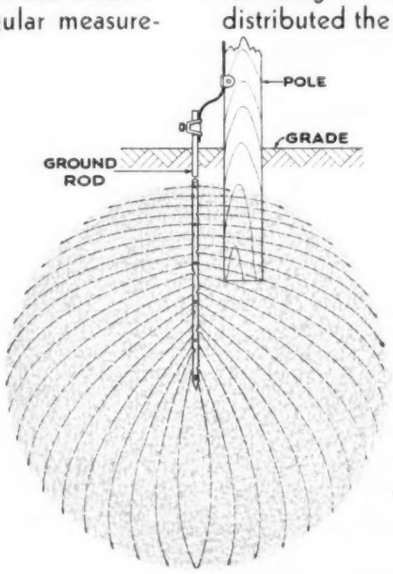

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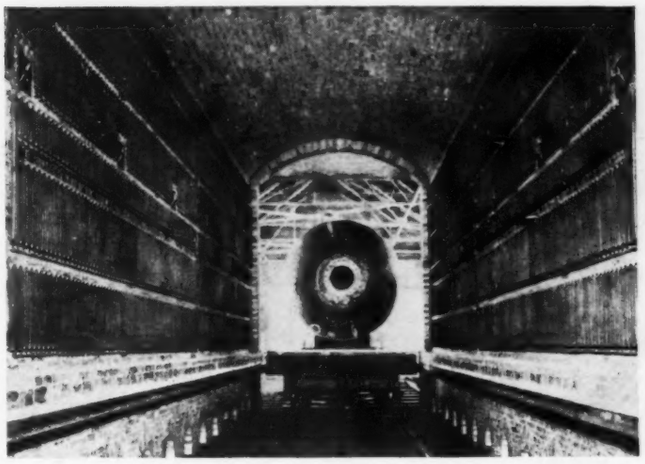

3,000-kw., car type electric furnace, A. O. Smith Corp. Milwaukee

APRIL 25, 1931

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CABLE ADDRESS: *"Machinist, N. Y."*

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter, January 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 17,700

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Avenue
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As Simple as a Pencil

ELECTRICAL WORLD

for the Week Ending

April 25, 1931

Senator Norris charges "write-ups" as if it were wrong to value property at its present rather than its past worth. According to this reasoning the land on Manhattan Island, which was sold by the Indians to the Dutch for $24, should still be assessed today for the original $24 and any additional assessment should be condemned as a "write-up."

PAUL S. CLAPP,
Managing Director
National Electric Light Association

Drought's effects on Pacific Coast

—**Water shortage in California** may equal drought of 1924. Oregon and Washington in somewhat more favorable position. Steam power will see utilities through, but irrigation may suffer—*p. 750.*

—**Electrification benefits cited** by Pennsylvania Railroad in reply to recent attack by the National Coal Association upon policy of rapidly outmoding steam power on its Eastern lines—*p. 769.*

Wholesaler asks fairer policies

—**West Coast wholesaler speaks** his mind on manufacturer-wholesaler relationships. Profits impossible in some lines under present conditions and margins thin at that. Consideration for wholesalers urged—*p. 771.*

—**Bond financing favored again** as utilities find senior securities to offer most attractive investment buying. Prospects for immediate future foreseen as favoring continued offering of this form of security—*p. 760.*

—**Wood insulation proves value** on transmission lines of Illinois utility by reducing shattering of cross-arms and pole-tops under lightning strokes. Interruptions also minimized—*p. 780.*

—**Built-in lighting for homes** utilizing gaseous-discharge tubes displayed in model home by architects. Health lighting and light for seeing combined here. A prophecy for the future?—*p. 752.*

Adjustable-blade turbine efficient

—**Hydro efficiencies are raised** by adjustable-blade turbine. Central Power & Light Company reports further upon economies of fixed blade and Kaplan units. Better than 10 per cent improvement shown—*p. 766.*

—**Missouri Supreme Court acts** to approve disbanding of electrical associations alleged to have conspired in restraint of trade. Wiring prices fixed, it was claimed. Is this but one of many similar bad-spots?—*p. 750.*

St. Louis "conspiracy" is smashed

Three St. Louis Electrical Bodies Dissolved for Violating State Anti-Trust Laws

ATTORNEYS representing three St. Louis electrical organizations—the Electrical Employers' Association, a contractors' body; the Electrical Approval Bureau, an inspection board, and the Electrical Protective Association, a clearing house for the payment by contractors of insurance premiums on group policies for themselves, union workmen and non-union employees—agreed on April 18 with Attorney-General Stratton Shartel of Missouri, the agreement being approved by the Missouri Supreme Court, that these organizations have been violating state anti-trust laws and consented to the revocation of their charters, dissolution to take place within 60 to 90 days. Similar judgment against a fourth organization, the Electrical Listing Bureau, a cost-estimating agency, was suspended on condition that price-fixing practices be abandoned.

Proceedings in this case were started about a year ago by the Attorney-General, upon information furnished by the St. Louis *Post-Dispatch*. The Attorney-General instituted *quo warranto* proceedings against the four corporations, charging them with conspiring to regulate prices and restrain trade. He charged that they were guilty of "unlawful and malicious perversions and abuses of their charters."

At the hearings which followed contractors testified that there was an agreement among them to charge a minimum of 33 1/3 per cent profit, that each contractor had to belong to each of the four organizations to do business in St. Louis, and that failure to comply with the regulations imposed by those who dominated the associations resulted in harassment, labor difficulties and loss of contracts.

Each contractor was compelled to pay to the Electrical Protective Association $2.80 a day for each union man in his employ for insurance (life and annuity) given to all members of Local Electrical Workers' Union No. 1, to the contractor and to his non-union employees. So far as the public—which eventually footed the bill—was concerned, the wage scale for union labor in the electrical trade was $16 a day, though the union worker received only $13.20.

This cost, as well as numerous fees, dues and assessments levied on the contractor by the associations, is eliminated by the ouster decree. Equally important, it is held, will be the resumption of competitive bidding for contracts by rival contractors who are no longer compelled by agreement to charge a fixed profit, thus making their bids for work almost uniform.

The Supreme Court assessed the costs of the litigation, estimated at about $5,000, against the defendant corporations. Individual indictments for conspiracy to violate anti-trust laws, brought against men dominant in the formation and management of the ousted companies, have been dismissed on the ground that the state's object has been accomplished, and that there is doubt that criminal intent could be proved. The Attorney-General regards the outcome of the proceedings as very important in stopping the spread of such schemes. Similar organizations operating in Kansas City will be warned, he said.

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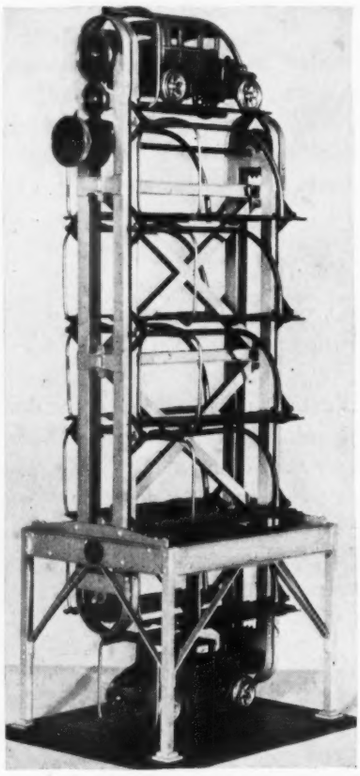
ELECTRICITY HELPS SOLVE PARKING PROBLEM



A fast-working system developed by H. D. James, Westinghouse consulting engineer, permits the vertical parking of cars in minimum space. Two electric motors under simple control drive the endless chains supporting the cradles. Each chain of cradles requires about 100 hp. Wide public acceptance of the idea, by which a driver himself stores and retrieves his car, is expected.

▼

Steam Plants in West Remedy Water Shortage

CALIFORNIA FACES A SEVERE water shortage during 1931, and a condition approaching that of 1924, the driest year of record, is indicated. This seasonal forecast for the 1931 water supply, made by the California Division of Water Resources, is based upon the results of the main snow surveys for the season, covering some 160 snow courses throughout the Sierra, and upon all available data to April 1 from the precipitation stations of the United States Weather Bureau, states, districts and public utilities in the mountainous portions of the state.

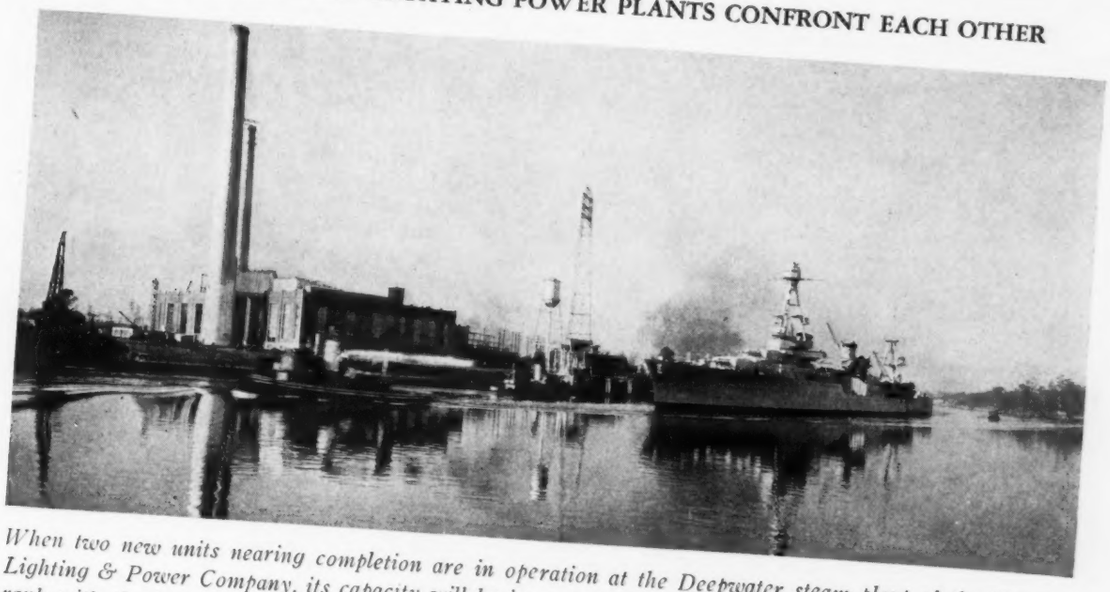
On account of this water shortage a notice has been issued through the State Engineer's office by the permanent committee of the Sacramento-San Joaquin River Problems Conference that cooperative conservation of water in the Sacramento and the San Joaquin Valleys must be the program this year. The committee says: "The most effective conservation measure possible at this time is limitation of acreages to be irrigated."

During the 1924 drought the water shortage caused a shortage of power, with the result that a power administrator was appointed, power was rationed, power companies borrowed from one another through interconnections, and obsolete steam plants were pressed into service to increase the power supply. This situation will not occur in 1931, for, following the experiences in 1924, the power companies took steps to avoid a recurrence by increasing their steam-plant capacity. F. R. George, engineer of electrical operation for the Pacific Gas & Electric Company, says: "We have ample power available to supply all of our system demands even though the remainder of the season should prove to be actually without precipitation."

R. H. Ballard, president Southern California Edison Company, expresses similar confidence, saying: "Increased steam-plant capacity of the Southern California Edison Company, together with the increase of 199,689 acre-ft. in water storage capacity since 1924, enables the company to meet the exigencies of a low-water year with complete assurance of adequate power for all purposes."

In the State of Washington indications are that run-off for the summer

STATIONARY AND FLOATING POWER PLANTS CONFRONT EACH OTHER



When two new units nearing completion are in operation at the Deepwater steam plant of the Houston Lighting & Power Company, its capacity will be increased from 100,000 kw. to 147,000 kw., and it will rank with the largest generating plants in the South. The picture shows the U.S.N. cruiser Houston, *which contains generators totaling 100,000 kw., in the ship channel on which Deepwater station is built.*

and fall of 1931 in the Puget Sound basin will be below the normal, but considerably above the record of the past two or three years, which were the driest in history.

In Oregon the situation is not considered serious, although rainfall has been below normal and there is danger of water shortage in the latter part of the summer. Power companies are not disturbed by these facts, however, because low rainfall during the last two years has given them added impetus to increase steam generating facilities.

The Intermountain section, as has already been reported in the ELECTRICAL WORLD (February 14, page 306, and April 4, page 621), will experience during the coming summer one of the most serious water shortages of its history unless a decided increase in precipitation occurs. Idaho, Utah and Wyoming all face these conditions. In Colorado light snowfall and precipitation below normal is reported. Clare N. Stannard of Denver, vice-president and general manager Public Service Company of Colorado, says that that company is fully equipped to handle all power demands placed upon it and that the additional facilities at the Valmont steam plant near Boulder have been completed opportunely. In Montana the snowfall in the mountains is light, and a water shortage in the spring and summer is expected. There is a general lack of moisture in Nevada, and the western part of that state is anticipating a severe lack of water.

Despite an unusually mild winter in British Columbia, there is no anticipation of a water shortage in that province.

▼ ▼ ▼

Power and Regulation in State Legislatures

ALABAMA.—The legislative committee appointed to investigate the electric utilities has decided to restrict its inquiry to the Alabama Power Company, Birmingham Electric Company, Alabama Utilities Company, Tuskegee Light & Power Company and Riviera Utilities Corporation. The committee will obtain a transcript of the Federal Power Commission's testimony concerning the Alabama Power Company.

The House ways and means committee has voted to continue the tax of 4 mills on each dollar of gross receipts collected by electric utility companies and the franchise tax of $2 on each $1,000 of capital employed in the state by domestic and foreign corporations. The bill to prevent public utilities from assessing penalties on overdue bills or from levying a service charge for installing equipment disconnected for nonpayment was defeated in the Senate judiciary committee by eight to three, not favorably reported as stated on April 11.

MISSOURI.—Assurance that the House bill to prohibit merchandising by public utilities will fail is contained in the decision by the Senate to advance no more measures at this session. The same is true of the House bill to give greater power to the Public Service Commission to investigate holding-company relationships—measures aimed especially at Doherty natural-gas companies. Of fifteen proposed laws affecting utilities introduced into the Legislature, now approaching its end, only three survive. One of these, passed by the House and now in a Senate committee, would confer on the Public Service Commission jurisdiction over holding companies owning 10 per cent or more of the voting stock of a Missouri utility. Another, also passed by the House and now in a Senate committee, would require each utility reporting to the commission to state the name and address and number of shares held by each holder of 1 per cent or more of stock. The third bill makes the fraudulent use of unmeasured gas a felony.

NEW HAMPSHIRE.—The Senate has passed a bill providing for taxation of electric and gas utilities in a manner similar to that applicable to railroad, express, telephone and telegraph companies, and the measure has been sent to the Governor for approval. It is provided that gas and electric utilities shall pay an annual tax upon the actual value of franchises, property and estate "at a rate as near as may be to the average rate of taxation upon other property throughout the state."

OKLAHOMA.—The Legislature has adjourned, leaving unenacted bills to take rate making out of the hands of the Corporation Commission, authorizing municipalities to tax electric and gas meters, requiring uniform schedules for electricity by corporations serving more than one town, concerning the right of municipalities to maintain utilities and issue bonds to be retired out of their earnings, declaring that the value reported to the commission by corporations for rate-making purposes shall be also the value for taxation, authorizing the submission of a consti-

tutional amendment providing means for public ownership and operation of utilities, and prohibiting the commission from changing franchise rates except upon requests from municipalities. The income-tax increase on corporations as well as individuals, referred to last week, was approved by the Governor; but the only bill aimed directly at electric utility practices to become law is the one, already reported, to prohibit utilities from merchandising appliances.

PENNSYLVANIA.—The three administration bills creating a Fair Rate Board and abolishing the Public Service Commission were reported for passage by the House committee on judiciary on April 21. The House utilities investigating committee remains deadlocked in its efforts to agree unanimously on a preliminary report. The report in its present form is said to find that the Public Service Commission has been derelict in its duty. Its submission has been postponed three times.

SOUTH CAROLINA.—A third attempt is being made to tax hydro power generated in the state. A free conference report submitted April 21 on the general appropriation bill includes an excise tax of 0.35 mill per kilowatt-hour. Such tax was voted down twice by the House this session, but was put in the appropriation bill by the Senate as an amendment. The rules now provide that this tax must be retained or rejected with the whole bill.

TENNESSEE.—A bill to prevent utility companies from selling merchandise has made its appearance. W. D. Kyser, president Memphis Power & Light Company, is taking the lead in the fight against it.

▼

Harrisburg Investigation Goes Merrily Along

BEFORE THE HOUSE COMMITTEE which is investigating the Pennsylvania Public Service Commission and the utilities, Roy Husselman, Cleveland valuation expert, last week criticised F. Herbert Snow, chief engineer of the commission, as having a "very technical, very engineering mind" which worked for the highest possible valuations. Mr. Husselman also testified that the valuation of the Luzerne Gas & Elcetric Company had been arbitrarily increased by a commission engineer because of pressure upon him from commissioners.

Another witness last week, O. M. Rau, said that the average cost claimed by electric companies for a mile of rural line is $2,000, or more than double the $947 which Burgess H. V. McNair of Middletown testified was the cost per mile to his borough of lines constructed by the municipal company.

Chairman W. D. B. Ainey of the commission and Commissioner W. B. Brown went on the stand on April 17 and denied that the valuation in a Scranton water-rate case had been fixed by guesswork or by "lump-sum" items, that items were arbitrarily increased to fit total figures already agreed upon, or that the commission was subject to political influence. W. M. Dietrich, one of the Governor's experts, criticised a bond issue of $100,000,000 which he said was soon to be placed on the market by the Pennsylvania Power & Light Company, and this brought up the question whether the commission has authority over such issues. Chairman Ainey cited the opinions of the Attorney-General and the Deputy Attorney-General in Governor Pinchot's first term that the commission had no such power.

▼

Ultra-Modern House Has "Sunlight" After Dark

ON EXHIBITION FOR A WEEK beginning April 18 at the Grand Central Palace, New York, has been a steel, aluminum and glass house suggested as suitable for a suburban dweller with pioneering instincts. The living room will have glass walls permitting the penetration of ultraviolet light from which the short rays have been filtered and which approximates sunlight in quality. Claude Neon low-voltage tubing, balanced to produce white light, is sunk in the ceiling over the glass, whence it is spread by Eriksen asymmetric chromium reflectors and Holophane refracting lenses. Ultraviolet tubing is installed at the proper points to facilitate control as desired. In the other parts of the house lighting units which harmonize with those of the main room are installed.

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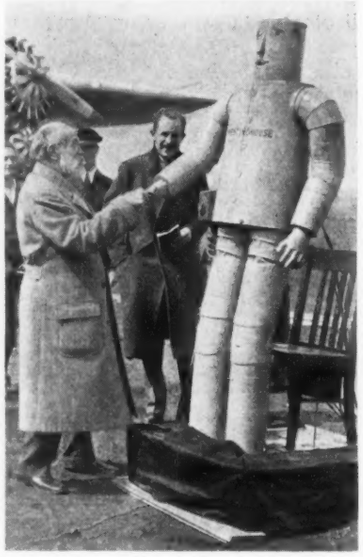
"MR. VOCALITE" STARTS FAST TRANSCONTINENTAL PLANE



Thirty-one-hour airplane passenger service between Newark, N. J., and San Francisco began recently when a Westinghouse mechanical man, on command of J. M. Barnett, Westinghouse engineer, provided the starting current.

▼

Missouri Men Hear Frank Talk from Commissioner

AN ADDRESS on public utility regulation delivered at the twenty-fifth annual convention of the Missouri Association of Public Utilities, held at Excelsior Springs, Mo., April 16 to 18, by Milton R. Stahl, chairman of the state Public Service Commission, was unusually frank in its presentation of the subject. Mr. Stahl, who compared the situation existing today among the utility interests to that of the legitimate liquor traffic before prohibition, said:

"The public utilities can avoid much future grief in the way of hostile legislation, based upon resentment instead of on wise consideration of a purely economic problem, if their responsible elements — the great majority — actively expose and oppose illegal and unethical practices on the part of others. Your public relations are affected by those of other utilities, and in your own interest you should see that any fundamental causes for bad public relations of other utilities are removed."

Other speakers were the retiring president, H. M. Patton; Ralph R. Parks, farm electrification specialist, and Henry Bussmann, president St. Louis Electrical Board of Trade. B. J. George of the Kansas City Power & Light Company led an open forum discussion of electrical matters.

Officers elected were: President, A. E. Bettis, vice-president Kansas City Power & Light Company; first vice-president, Fred Karr, St. Joseph; second vice-president, Worth Bates, Lexington; third vice-president, Powell Groner, Kansas City; treasurer, Hermann Spoehrer, St. Louis; secretary, F. D. Beardslee, Webster Groves; assistant secretary, Jesse Blythe, Jefferson City.

▼

Oregon Hydro Projects Still Await Sanction

OREGON'S HYDRO-ELECTRIC COMMISSION or the local courts must soon decide whether or not that state is to benefit by the development of three water-power projects which will ultimately entail an

expenditure of approximately $56,000,000. If the commission grant applications for power permits filed by the California-Oregon Power Company, it will remove the last obstacle in the way of immediate construction of seven hydro-electric power units on Klamath River at the approximate cost of $21,000,000 and later construction by the same utility of seven power units on the Umpqua at an approximate cost of $29,650,000. Also awaiting action of the commission is the construction of projects by the Northwest Power Company on Marion Lake and the North Santiam River which will, when completed, cost about $6,000,000.

So far as the Klamath River projects are concerned, state authorities frankly voice the desire that the California-Oregon Power Company seek the aid of the courts in the adjudication of water rights upon it. Relative to the proposed Umpqua River developments, it is understood by the regulatory board that the principal objector, the city of Roseburg, and the power company are negotiating a satisfactory understanding.

The Northwest Power Company, a subsidiary of the Portland General Electric, has on file with the state completed applications for permits to develop power on a lake and a stream in the central Willamette Valley. The State Reclamation Commission was on the point of granting these applications when the city of Salem interposed applications for the prior use of the waters for municipal purposes, and the state allowed it six months to perfect its filing.

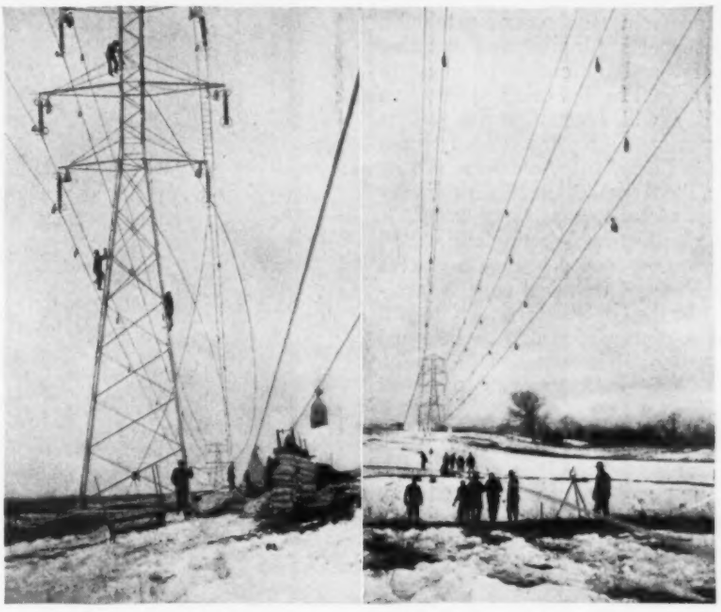
▼

Oregon's Hydro Board Completes Regulations

RULES AND REGULATIONS of the Oregon Hydro-Electric Commission, just completed, provide that hereafter applicants for permits to appropriate water for power purposes shall pay to the state an initial fee of $50 and that the applicant shall thereafter remit, at the request of the commission, such further sum not exceeding $200 as shall be determined by the commission to cover costs of recording and investigation.

These fees are required where the permits are for 100 hp. and over, while applications involving plants of smaller rating are classified as minor projects and assessed $1 per horsepower on filing and a further $1 per horsepower as shall be determined by the commission to cover clerical costs. The new regulations provide also that licenses may be issued for either minor projects or major projects after proper investigation without a preliminary permit. No preliminary permit or license involving 1,000 hp. or more will be granted until at least six months after the filing of application.

Storm Tests Made on New-Type Transmission Towers-



FIELD tests to prove the ability of a new type of transmission-line tower to withstand unusual strains have just been completed by engineers of the New York Power & Light Corporation, in the presence of company officials, engineers of associated companies and designers of transmission-line structures. These tests, among the most complete ever attempted anywhere, were made on the company's 110-kv. Thompson-Greenbush line, in the vicinity of Troy, and covered a period of four days. The tests indicated that towers of this type might be expected to withstand the severe strains for which they were designed, and they will undoubtedly be used in future construction of the company's main lines, notably the one which is proposed as an interconnection between the systems of the New York Power & Light Corporation and New York Edison Company.

A main purpose was to check the theoretical calculations which entered into the design of the towers. The Thompson-Greenbush structures, erected last year, are the heaviest on the company's system and were especially designed to meet unusual strains placed on towers and lines during heavy sleet and wind storms. Before attempting these field tests careful calculations were made to determine the additional weight the line would be subjected to with one-half inch of ice coating on wires and towers and also the additional strain the line would have to withstand from the pressure of a 60-mile-per-hour wind blowing against it while so loaded.

With these weights and pressures determined, the strains were duplicated in the field. The weight of ice loading was provided by suspending sandbags from the wires and towers. Over 500 such bags, with total weight of 25 tons, were used. The test tower was then subjected, through turnbuckles placed in anchored strain wires, to a mechanical side strain of about 5 tons, an amount corresponding to the pressure which would be exerted on the structures by a 60-mile gale.

With the tower under this terrific strain, one of the conductors was cut to determine what the unbalancing effect on the tower would be. Further than the slipping of the conductor through the safety clamp to the ground, no noticeable damage was observed. The tower having withstood this strain, a second conductor was cut to give a still further unbalancing effect, and even then the tower failed to show any signs of damage.

▼

A.I.E.E. Rochester Topics Include Noise Abatement

FOUR TECHNICAL SESSIONS, one on noise abatement, one on lightning and two on selected subjects, will be held at the convention of the Northeastern District of the American Institute of Electrical Engineers at Rochester, N. Y., April 29 to May 2.

Wednesday morning's subjects will concern temperatures in power cables, proximity effect in cable sheaths, cusps in the speed-torque curves of induction motors and losses in transformers used with mercury-arc rectifiers, and in the afternoon the thermal breakdown of solid dielectrics, the three-circuit transformer, core-loss measurements at high flux density and equivalent circuits of imperfect condensers will be discussed.

The papers on noise will be presented

on Thursday and cover measurement of noise in electrical machinery, indicating noise meters, noise from induction regulators and from synchronous machines, elastic supports for isolating rotating machinery, and mitigation of noise in substations. The lightning symposium on Friday will recount investigations and experiments on the Pennsylvania Power & Light, the American Gas & Electric, the Appalachian Electric Power and other systems.

General Electric, Westinghouse, Bell Telephone and central-station engineers and members of technical college faculties will be the contributors. There will also be a dinner meeting, an informal reception, entertainment and inspection trips, as well as a students' technical session.

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East Texas Oil Brings Power Lines in Its Wake

ELECTRIFICATION OF THE east Texas oil district, embacing Rusk, Gregg and Smith Counties, is progressing rapidly. The expansion program is being carried out by the Southwestern Gas & Electric Company, which has completed a 66,000-volt loop through the producing area. This loop receives energy from the company's 66,000-volt transmission line connecting with the 30,000-kw. generating station at Shreveport, La., and from the 60,000-volt line that runs west from Longview, intersecting the trunk transmission line of the Texas Power & Light Company at Mineola and Grand Saline. The oil-field power transmission system of the Southwestern Gas & Electric is also interconnected with the transmission lines of the Arkansas Power & Light and Oklahoma Public Service companies.

In addition to the construction work already done by the Southwestern Gas & Electric Company, the Arkansas Power & Light plans to extend a 66,000-volt line from Ogden, Ark., to Marshall, Tex.

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Niagara-Hudson Power to Reach New York in 1931

"RIGHTS-OF-WAY AND FRANCHISES to meet the lines of the New York City companies have been obtained," said Floyd L. Carlisle, chairman Niagara-Hudson Power Corporation, at the annual meeting of that organization in New York last week, "and deliveries of power to these companies will start this year. The Niagara-Hudson Power Corporation has co-operated in every way with the state administration in the development of the St. Lawrence water-power project," Mr. Carlisle said further. "I see no difficulty in working out a program whereby the St. Lawrence power will be distributed by the corporation."

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WHEN THE LIGHTS ARE ON IN CHINATOWN

—Wide World Photos.

Grant Avenue, San Francisco, main street of the largest Chinese colony in America, holds its own with other main streets in illumination, as this recent photograph shows.

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Engineering Foundation's Dam and Other Researches

STUDIES OF LARGE DAMS in several states are being continued by the Engineering Foundation, but, that body reports, not without many difficulties, not the least of which, it says, has been unexplained trouble with the electrical instruments used.

At Princeton University Prof. George E. Beggs has tested celluloid models of the experimental dam erected in 1926 on Stevenson Creek in the San Joaquin Valley of California under the direction of a national committee of civil engineers. The Stevenson Creek dam was constructed, as reported at the time, so that it might be destroyed in the interest of science. It is 60 ft. high and 40 ft. long and has attracted world interest among engineers and scientists because of the attempt to solve problems centuries old involving safety of life and property.

"The Stevenson Creek dam still stands," the report says. "Destruction of testing equipment and deposition of boulders and sand against its back by the floods of November and December, 1926, prevented the second program of tests, planned by the committee to go to the breaking of the dam if practicable. To build the dam up from its present height to a proposed height of 100 ft. with a thickness of 2 ft., clear the débris from its upstream side and provide new testing equipment would, it has been estimated, cost $56,000, and no funds are available. In view of the satisfactory correlation of tests of models with tests of the dam the committee believes that so great an expense would not be justified. Long-time tests on the concrete of Stevenson Creek dam have been continued at the University of California."

At the request of the American Institute of Electrical Engineers, the Engineering Foundation is aiding an investigation of pure iron electrodes to obtain basic data of use to electric welders. This research is being conducted by Prof. Gilbert D. Doan under an agreement between the Foundation and Lehigh University. Progress has been made in designing and installing special apparatus and in developing methods. An inquiry into the fundamental properties of dielectrics, carried on at Johns Hopkins, is another that the Foundation has under way.

Scattered Happenings in the Electrical Sphere

UNITED STATES

Edison Service Wins

Despite strong competition from a heat-balance plan, including a steam turbine and Diesel engines, the Commonwealth Edison Company has won the contract for electricity supply to the 43-story Marshall Field estate office building whose erection will start this summer in Chicago's "Loop."

Appliance Sales in Tacoma

Tacoma (Wash.) city fathers have been debating publicly whether the city light department shall go out of the business of selling electric ranges, water heaters and other appliances, as desired by retailers. Superintendent Llewellyn Evans submitted figures to show that of 684 ranges sold in Tacoma last year, 383 were sold by the city, against about 300 by retail merchants, the latter including 169 sold to apartment houses direct by manufacturers. The city appliance department made a profit in 1926, 1927 and 1928, but lost enough to offset the profit in 1929 and 1930, figures showed.

Goshen (Ind.) City Plant Sold

The Northern Indiana Public Service Company has been authorized by the Indiana Public Service Commission to purchase the municipally owned electric properties of the city of Goshen, Ind.

Cleveland's Municipal Plant

A special committee has been appointed by the Cleveland Chamber of Commerce to investigate the municipal lighting plant of that city and arrive at conclusions regarding its economy and usefulness. George S. Case will head the committee, appointment of which follows recommendation by a city power engineer for plant expansion.

Gives up Oregon Hydro Site

A definitely unfavorable result of recent legislation in Oregon is indicated by the action of the California-Oregon Power Company in filing application with the Federal Power Commission for a preliminary permit for a hydro-electric development on the Klamath River a short distance over the state line in California. The company had originally planned this development on the same river in Oregon near Keno.

Work to Start on Texas Dams

Contract for the construction of the first of the proposed series of six dams on the Colorado River, Texas, has been awarded for approximately $3,200,000. The dam will be 9,000 ft. long and have a maximum height of 137 ft. above the river bed. The contract embraces the housing for the hydro-electric equipment, but the latter will be purchased separately at an additional cost of $500,000. The site is near Kingsland, about 50 miles north of Austin. The Emery, Peck & Rockwood Development Company of Chicago is building the plant, which will generate 30,000 hp. for the Central Texas Company.

Rural Service in New York

Eight hundred and sixty miles of rural line, giving service to 3,764 new farm customers, were built in New York State in 1930 by the Niagara-Hudson Power system, according to its annual report, and rural consumption of electricity rose 35 per cent over 1929.

Nebraska Farmers Lose Out

The first and so far the only attempt made by Nebraska farmers to take advantage of a law they had passed a number of years ago which permitted the creation of rural lighting districts with authority to construct plants and distribution systems and also to buy energy has ended in complete failure. The district was created in Saunders County and $28,000 in bonds issued to finance a distribution system, a contract for energy being made with the Wahoo municipal plant. Litigation followed, and the law was three times declared unconstitutional after legislative corrections had been attempted. The Iowa-Nebraska Light & Power Company has now purchased the distribution system for $21,000, with provisions for future resale, the bondholders losing $7,000.

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Coming Meetings

American Institute of Electrical Engineers — District meeting, Sagamore Hotel, Rochester, April 29-May 2; summer convention, Asheville, N. C., June 22-26. F. L. Hutchinson, 33 W. 39th St., New York.

East Central Division, N.E.L.A. — Deshler-Wallick Hotel, Columbus, Ohio. May 11-13. D. L. Gaskill, 603 Broadway, Greenville, Ohio.

National Electrical Manufacturers' Association — Hot Springs, Va., May 18-23. A. W. Berresford, 420 Lexington Ave., New York.

Middle West Division and Nebraska Division, N.E.L.A.—Excelsior Springs, Mo., May 20-22. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

National Electrical Credit Association—Hotel Pennsylvania, New York, May 21 and 22. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Electrical Wholesalers' Association—Hot Springs, Va., May 27-30. E. Donald Tolles, 165 Broadway, New York.

Wisconsin Utilities Association — Accounting Section, Racine, May 28-29. J. N. Cadby, 135 W. Wells St., Milwaukee.

National Electric Light Association—Atlantic City, June 8-12. A. J. Marshall, 420 Lexington Ave., New York.

Public Utilities Advertising Association—New York, June 14-16. Room 1748, 4 Irving Place, New York.

Association of Iron and Steel Electrical Engineers—Cleveland, June 15-19. J. F. Kelly, Empire Bldg., Pittsburgh.

Canadian Electrical Association—Banff Springs Hotel, Banff, Alberta, June 16-18. H. M. Lyster, 407 Power Bldg., Montreal.

Pacific Coast Section, N.E.L.A.—Del Monte, Calif., June 24-27. K. I. Dazey, 447 Sutter St., San Francisco.

Gary (Ind.) Utility Sold

Confirmation of the sale of the Gary (Ind.) Heat, Light & Water Company, formerly owned by the United States Steel Corporation, to the Midland United Company, an Insull organization, has been given. Possible change of service from 25-cycle to 60-cycle in whole or part is to be studied.

San Francisco Regulatory Body

By a provision of a new charter for San Francisco, voted by the people on March 26 and just ratified by the Legislature to become effective in January, 1932, a public utility commission of five members will be established to which control of present and future municipal utilities will be intrusted.

Cheat River Appeal Allowed

An appeal from the decision of the Kanawha County (W. Va.) Circuit Court in the Cheat River water-power case has been granted by the Supreme Court of that state, which will now review the case. The Circuit Court, as reported at the time, reversed a Public Service Commission order granting a license to the West Virginia Power & Transmission Company, subsidiary of the West Penn, for eight hydro-electric developments on the Cheat and Blackwater Rivers. The Circuit Court sustained the constitutionality of the water-power law, but held that advantages from the hydro developments would not accrue to the state as a whole.

CANADA

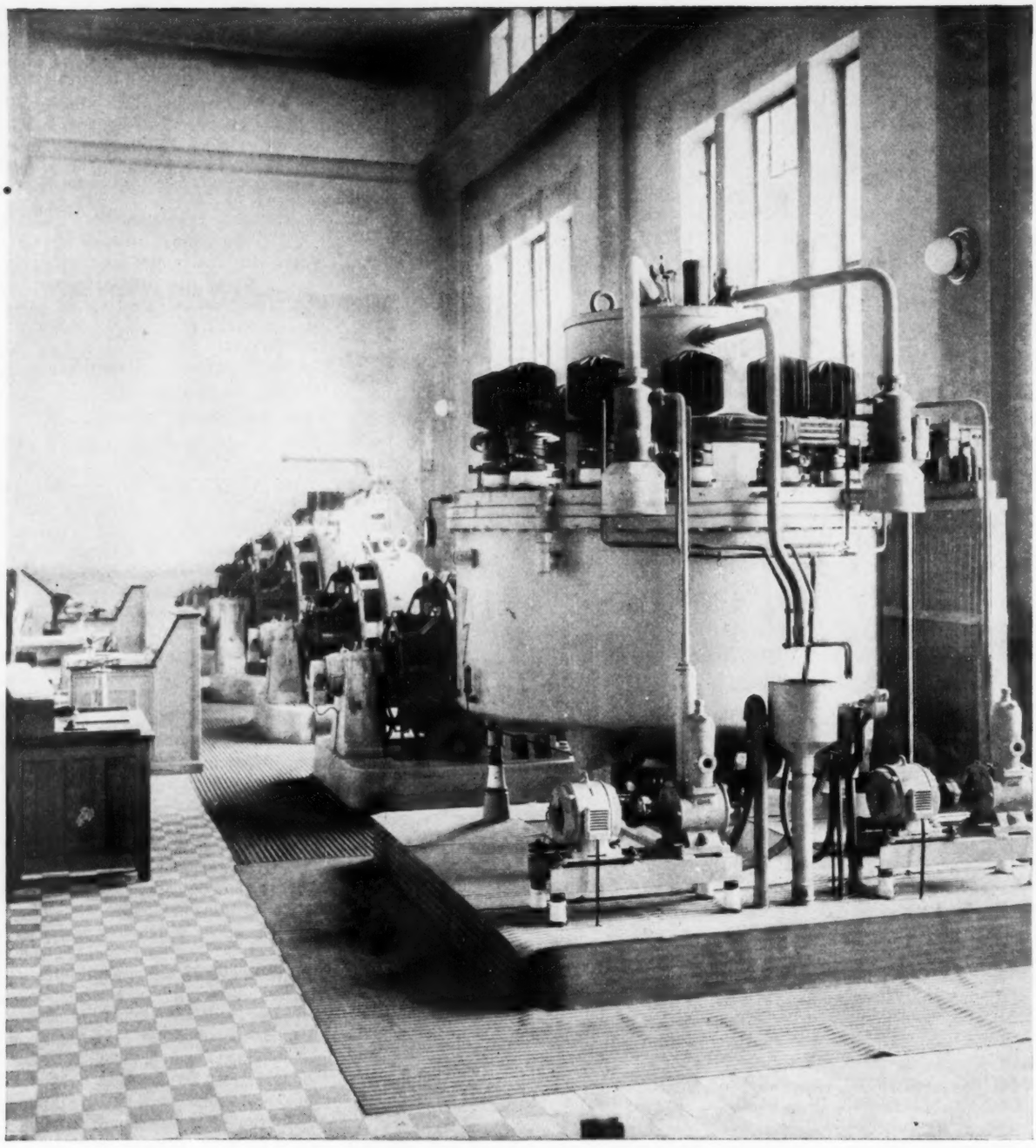
"Insull, Spare That Tree"

D. G. McKenzie, Manitoba Minister of Natural Resources, asserted recently in the provincial Legislature that the government would protect its hydro power rates if they are threatened by the "inroads" of the Insull interests of Chicago into the Winnipeg Electric Company, as some legislators seemed to think they would be. The lease of the Seven Sisters power site, held by the Northwestern Power Company, a Winnipeg Electric subsidiary, will be canceled "should the terms of the lease be varied in any respect," Mr. McKenzie said.

ABROAD

Micro-Ray Two-Way Telephony

A demonstration of two-way radio telephony with a wave length of 18 cm. across the British Channel between Dover and Calais has been made jointly by the International Telephone & Telegraph laboratories of Great Britain and the Matériel Téléphonique laboratories of France. The results obtained, it is held, indicate that the range of wave lengths between 10 cm. and 100 cm. is now ripe for commercial development. It is stated that the number of frequencies available within this band is nine times as great as in the whole of the band hitherto used in radio.



A 4,250-kw., 1,500-volt mercury-arc rectifier

Installed in a substation of the Czechoslovakian State Railways in Prague, this 4,250-kw., six-phase rectifier is one of the largest to have been manufactured.

Because of its large overload capacity this unit handles with ease the 6,000-kw. maximum peak load of the plant formerly supplied by the two 2,000-kw. and two 1,000-kw. rotary converters in the background.

Obvious is the saving in space afforded. The rotaries are not operated, except occasionally to maintain their running condition. Low cost and high reliability are said to be features.

EDITORIALS

L.W.W.MORROW
Editor

Hartford reports encouragingly on mercury-turbine operation

RETUBING of the mercury boiler of the Hartford Electric Light Company has been ordered as a result of a leak following a year's successful operation, and an improved design to facilitate circulation and stop vibration is to be applied to this equipment at the earliest possible moment. During the year's run the unit delivered 135,000,000 kw.-hr., including energy produced by steam from the mercury condenser, at an average net rate of 10,100 B.t.u. The outfit played an important part in increasing the company's net earnings, and other units have been ordered for service elsewhere on the strength of this performance. The best engineering opinion regrets the present shutdown but is certain that when the South Meadow unit is restored to service operating economy and service reliability will be enjoyed on the same or an even better scale than before. Investigation has shown that the mercury process had nothing to do with the tube leak, which was brought about through the vibration of a small filler piece. In retubing the filler piece and loose fits will be eliminated. When the mercury turbine was examined after the year's run, the amount of erosion present was so small as to be unlikely to cause any trouble for years.

The company's confidence in the mercury-vapor process is unshaken by the tube failure, and the year's record is of such commanding significance that the consideration of such equipment in steam-plant design cannot safely be omitted. On account of the original designing required to overcome even minor defects which reveal themselves in the commercial service of such new apparatus, it will take some time to retube the Hartford boiler; but it would be a mistake to conclude that the process has lost engineering caste because the reconstruction of the tubes cannot be done in a few weeks. Had the trouble developed in the spring of 1930, the implications would have been far more serious. The company is to be commended for its frank release of the facts, and both it and the industry will undoubtedly be rewarded by the concentration of engineering skill which is being brought to bear upon the early solution of the present difficulty.

Facts on marketing and sales

THE electrical industry builds and sells many products through the traditional trade channel of manufacturer, jobber, dealer. Each of these agencies has its own problems and functions and yet must unite with the others to make distribution a successful and economical enterprise.

It is encouraging to be able to print in this issue a frank and factual contribution from a contractor-dealer. He shows his sales, his costs and his profit margins and states his opinion about needed changes in the commercial mechanism. This is done for a constructive purpose and for the benefit of the industry.

Facts on distribution are necessary before generalized conclusions can be made. The facts contributed by Mr. Boyd may not be representative, and there may be disagreement with his business conduct or with his accounting allocations. Nevertheless, the conditions stated and the facts given are those of a competent operating business unit. They deserve the study of the industry. More facts of this character on the actual business affairs of manufacturer, jobber and dealer will help the industry arrive at a distribution mechanism to fit present conditions. Facts and not opinions are needed, and we are very glad to publish this example of a factual study of a single industry unit. We hope to publish more

in the near future and to obtain, in the light of facts disclosed, competent industry opinion on changes in the distribution mechanism that will help the industry develop its markets more rapidly and more efficiently. That is the goal all distribution agencies are striving to reach.

Improving trend in decorative lighting

ILLUMINATION is more of an art than ever, but its esthetic aspects are hardly of primary engineering concern. On a recent cross-country trip the progress of decorative lighting in the newer railroad stations, hotels, office buildings, banks and theaters was most encouraging. Fixtures illustrated a wealth of designing talent capable of meeting the most diverse demands; new applications of low-intensity panel lighting in graded coloring broke the monotony of unrelieved wall surfaces, and everywhere the layout of circuits and switching for refinements in convenience of use evidenced the arrival of a new era of cooperation between the interior decorator and the engineer.

Electricity is now so cheap that there ought to be little difficulty in getting acceptance of the lamp wattages best suited for every class of service, regardless of the type of fixture selected. The engineer can be counted upon to do his part in insuring the necessary supply of energy, although at times his voice should be heard more strongly in support of adequate wattages for fixtures and layouts in which the art motif predominates. Dimly lighted interiors command a measure of fashionable support in some cases, but on the whole this cult bids fair to be of temporary popularity.

Air conditioning needs experience data

MAN is an indoor animal. The atmosphere in which he lives, moves and has his being, inclosed within four walls for the greater number of the hours of his life, has a direct bearing on the total number of these hours and on the pleasure he has in them. If that atmosphere can be maintained at the optimum condition of temperature and humidity for human comfort and health by the use of electricity, then why is electricity not more used for that purpose? The answer is that the way to do this is not generally known in the sense that applications of electricity to power and lighting are common knowledge.

Air conditioning is not an esoteric science. Its fundamentals have been established and are easy to understand. But its theory is not reinforced by the large quantity of experience data that is necessary for popular acceptance of the art. These data must be collected and integrated into convincing evidence by those who have a commercial interest in air conditioning—central stations and engineers. The onus of the task must be on the central stations, because they are in better position to assume it. It is the duty of central-station engineers and power salesmen to study continuously the air-conditioning installations to which their companies supply power. Only by such research can data sufficient in quantity and quality adequately to promote the art be accumulated.

Croesus turns pessimist

WHAT may be called the pessimism phase of the business cycle usually manifests itself toward the end of the decline in commodity prices, just as signs of the turn begin to appear. Among its characteristics are a widespread impression that conditions are worse than at any previous time and that still worse happenings are in sight. There is a persistent disregard of such evidences of the upturn as do exist.

Some of the evidences of improvement which the National Industrial Conference Board has observed in summing up March's business are a sharp advance in construction, a larger than seasonal rise in automobile output, a 10 per cent gain in steel-ingot production against a normal increase of 5 per cent, and an 8 per cent gain in bituminous coal mined in the month. It is true that some basic indicators show a slight reversal so far in April, but they are not of sufficient weight to establish a trend.

No one can say, however, that the depression is over, although it has now lasted five months longer than the average of the last two previous

depressions. Some more dividends may have to be cut and some more expenditures reduced. But there is more evidence to support the recently expressed view of a nationally known statistician that the turn has been made than there is evidence that the worst is yet to come. From the historical and psychological point of view the gloom which exists at the present time is really a bright signal for a clear track ahead.

Divining rod not magic

BELIEF that a rod or stick carried in the hands should tip or deflect when passing over subterranean water has apparently so much of the irrational about it that to most people it has been classed with other fantastic ideas smacking of superstition or necromancy. Nevertheless, this supposed art has refused to be put down.

Now comes a report on an investigation of the divining rod from a doctor of engineering who publishes the results in a recent number of the *Elektrotechnische Zeitschrift*. Briefly it appears that the dipping of the divining rod is due to an electric shock to the carrier, causing a spasmodic contraction of the muscles of the arms. The shock results from a difference in electric potential between the two ends of the rod as it passes into an electrostatic field due to a distributed charge of electricity in the earth caused in turn by the friction of flowing water beneath the surface. This at least is the theory, and it must be confessed that it seems to be fairly well borne out by the facts.

Having developed the technique for maximum sensitivity for himself, the author finds, for example, that the response to underground water is found only with rods of conducting material and only when the water is flowing. Its magnitude depends on the velocity with which the rod is carried into the supposed electric field and also on the direction of motion. Corresponding effects are observed in connection with a single subterranean electric cable carrying current, but no response is found in the case of an outgoing and return conductor.

A number of other qualitative investigations are reported, among them one showing that the effect cannot be magnetic. Among a comparatively large number of persons only about one-third were found sufficiently sensitive to respond, and most of these only after instruction. Efforts to obtain quantitative measurements or direct indications on sensitive instruments failed, and it thus appears that the human physiological detector is more sensitive than any other. The report bears the stamp of authority, but most of those who have realized from experience the values of voltage which are necessary to give an appreciable shock will wonder at the sensitivity which must necessarily be possessed by the artist of the divining rod.

Underground lines for rural electrification

A VERY interesting plan for underground rural distribution lines was submitted to the underground systems committee of the National Electric Light Association at Cleveland on April 22. It is claimed that for single-phase circuits which will not require an increase to three-phase for a number of years a two-conductor, concentric-type, non-metallic sheath cable with only one conductor insulated and the other conductor wrapped concentrically around the insulation of the first conductor and inside the outer covering can be installed at $830 per mile exclusive of overhead. This is lower than the cost of a pole line. It is also claimed that a 4,600-volt circuit can be similarly provided at $1,036.50 per mile.

This type of cable is comparatively new, but has been used extensively for street-lighting, railroad-signaling, airport, golf-course, park and parkway-lighting installations. The transformers are installed above ground either on stub poles or in small housings made up of sewer pipe with suitable casing. There are no doubt many cases where the trenching is easy and where there is no great amount of rock to be encountered, so that a plow can be used for trenching. If the low costs are confirmed by a number of actual installations, the new method of distribution would not only be economical but would also overcome the objections of estate owners and residential municipalities to overhead lines. It is indeed gratifying to see some new engineering applied to rural distribution problems, and further investigation should be encouraged.

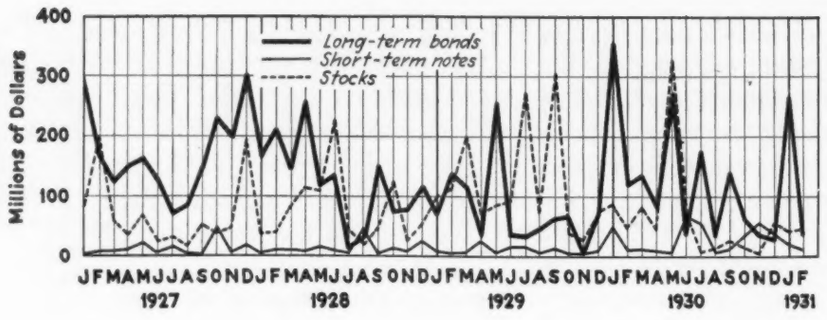


Fig. 1—Volume of utility issues

Bond Financing Favored This Year

By J. A. LYLES
Harris, Forbes & Company

What are prospects for financing needs of utility industry during the remainder of 1931?

What are the governing elements?

What type of securities will dominate? Is another senior financing year in prospect?

What are pros and cons of the various types of financing likely to dominate?

COINCIDENT with the rapid growth of the public utility industry during the past fifteen years has been an equally rapid increase in the volume of new security issues sold to the public to obtain the money needed by the expanding organizations. The aggregate amount raised for the public utility industry through the sale of securities has exceeded in recent years the volume of funds obtained for the railroads. This type of financing now leads all other corporate classifications and, in fact, exceeds the volume of municipal, state and city financing in this country.

Ready marketability, a reasonable degree of safety of principal and opportunities for profits are important requisites for the securities of any industry which is dependent upon the raising of substantial public funds with which to continue its progress. The steady growth of earnings, coupled with extremely small fluctuations therein between good times and bad; the regulated and monopolistic nature of the business and the essential nature of the services rendered combine to give a sound basis for the issuance of securities by companies engaged in this industry.

The record of price appreciation of public utility stocks and the absence of a large number of defaults in the fixed-interest-bearing obligations of electric power and light companies combine to make these securities attractive to the investing public. Added strength to the credit of the industry as a whole has been derived from the far-sighted attitude of capable managements which have provided carefully arranged financial structures, which have taken full advantage of continued engineering progress resulting in decreased expenses and which have provided increasingly better and more reliable service at consistently lower rates.

Since the public utility operating company's assets consist largely of fixed property in the form of generating stations and transmission and distribution lines, it is possible for such a company to issue not only common and preferred stocks but also mortgage bonds secured by a direct lien on the fixed assets. The importance of this feature cannot be overlooked, since it permits the issuance of different types of securities at different times—when each has some special advantage marketwise. Thus, at certain times money may readily be raised through the issuance of common stocks which have the advantage to the issuing company of not requiring fixed dividend or interest payments such as might cause difficulties during temporary periods of reduced earnings. At other times the funds needed for expansion may be obtained more cheaply through the sale of bonds, which, although requiring fixed interest payments, generally have the advantage of providing funds on the lowest cost basis.

While mortgage bonds may be issued by its subsidiaries, it is impossible for a holding company to issue interest-bearing obligations, directly secured by fixed property. Therefore, there has come into general use the "debenture," which is an obligation requiring the payment of a fixed amount of money at a certain time, with interest during the interval, but which is absolutely unsecured by a direct lien on any assets of the issuing corporation. The debenture issue of a holding company is generally not very different from an ordinary note, except that it usually matures after a life of from fifteen to thirty years or more instead of in one to ten years, as in the case of the usual note issue.

As an incentive to the purchaser, many debentures have been issued with the privilege of conversion, for a limited time, into the common stock of the issuing corporation. The inclusion of a conversion privilege in a debenture is often adopted to permit the issuance of the

debentures at a higher price than would otherwise be justified, because of the possible future value of the conversion privilege. Thus, during the poor bond market and the good stock market of the first three-quarters of 1929 many holding company debenture issues contained conversion features and permitted the raising of senior money on a lower cost basis than would have been possible through the issuance of straight debentures.

During a rising and active stock market new issues of common stocks may more easily be sold than at a time of business depression and declining stock prices. Likewise, when bond prices are high, and yields are therefore, low, it is often possible to raise new money more cheaply and easily through the issuance of mortgage bonds. Holding company debenture issues invariably sell on a higher yield basis than do mortgage bonds of a comparable grade and are, furthermore, generally more quickly affected marketwise by unfavorable developments. They are, consequently, not readily salable during periods of business depression, but may be sold on a fair price basis during good times, and particularly, with the aid of a conversion feature, during a period of rising stock prices.

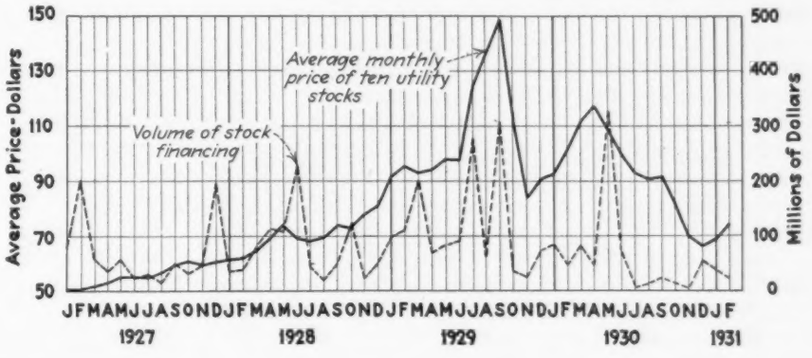


Fig. 3—Average monthly price of ten utility mortgage bonds vs. volume of long-term bond issues

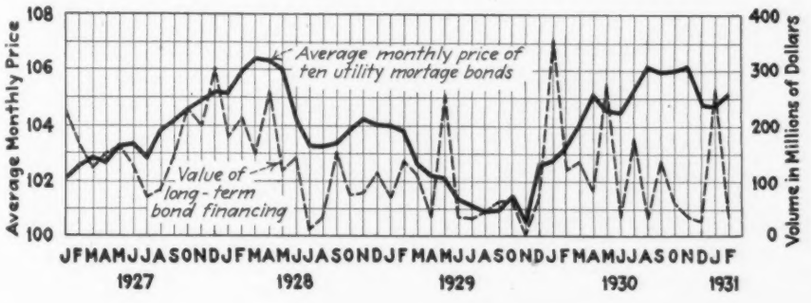
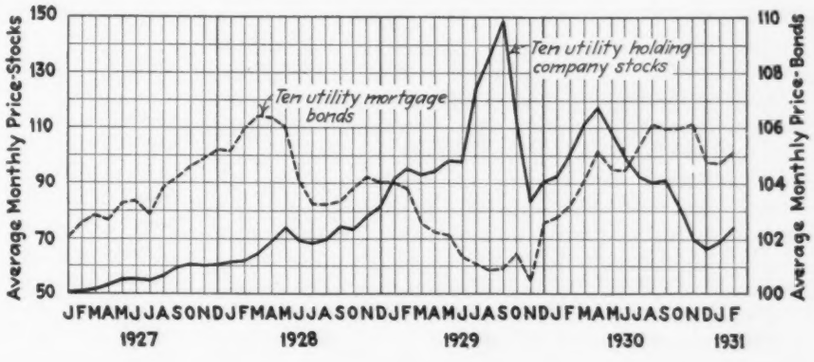


Fig. 2—Average monthly price of ten utility company stocks vs. volume of utility stock issues

Fig. 4—Average monthly price of ten utility holding company stocks vs. ten utility mortgage bonds

Monthly yield of each bond figured from average monthly price. Average of these ten equated to price of 5 per cent bond due in twenty years.



Short-term note issues, usually maturing in one to ten years, are perhaps more stable in price than other types of issue because of their short life. The price for this type of issue, particularly of the shorter maturities, varies closely in accordance with commercial paper rates, and thus these securities may often be issued at good prices in times of depressed long-term bond markets. Such notes, however, must shortly be refunded and therefore are usually utilized only as a temporary expedient pending permanent financing.

The cost of obtaining money for an enterprise at any time is dependent upon the element of safety inherent in the security offered, i.e., the degree of assurance that, in the case of bonds and notes, both principal and interest will be paid when due, and that, in the case of preferred stocks, dividends will regularly be paid. The purchase of common stocks involves the risks of ownership and, consequently, the returns, either in income or in possibilities of appreciation, should be greater than in the case of senior securities. Thus different types of securities sell on different yield bases commensurate with their various degrees of safety. For example, at the present time (April 20, 1931) Electric Power & Light Corporation's preferred stocks are selling to yield 6.19 per cent and 6.51 per cent, while its 5 per cent debentures yield 5.63 per cent to maturity. At the same time the first mortgage 5 per cent bonds of Idaho Power Company, a subsidiary of Electric Power & Light Corporation, are selling to yield only 4.53 per cent to maturity. The yields of these securities thus decrease as the degree of safety increases. On the other hand, the common stock of Electric Power & Light Corporation is selling to yield just over 2 per cent. This is very probably a reflection of the confidence in which the corporation's management is generally held and of the possibilities of appreciation in the market value of the stock rather than a consideration of the current yield thereon.

The cost of money to a given concern is usually lowest when the money is obtained through the sale of mortgage bonds. It would therefore seem advisable to finance almost exclusively through such issues. This is not the

case, however, since the interest charges on bonds are a constant and immediate claim on earnings and cannot be avoided without disaster even in periods of greatly reduced earning power. Therefore, a compromise must be reached whereby a part of the money is raised through the sale of bonds and the balance by the sale of common and preferred stocks, so as to insure a happy medium between the cost of the new money and the continuing fixed charges which must be met out of the current earnings. The accepted set-up for an operating company is generally stated at 50 per cent of the capitalization represented by bonds, 25 per cent by preferred stock and 25 per cent by common stock. The capital structure is, of course, arranged so that, in addition to obtaining a stable structure, as large a proportion as possible of each dollar of net revenue will accrue to the common stock and therefore to the owners of the business.

A company having a well-balanced financial structure is insured thereby of having a measure of financial stability, and since to accomplish this end it is often advisable to have several types of securities outstanding, the utility companies are generally in the favorable position of being able to offer at a given time the particular type of issue which is then most in favor with the investing public, as has been pointed out above. This opportunity is not overlooked and the utility companies are quick to seize upon the most advantageous method of raising money which the temporary condition of various security markets will permit.

Security markets determine type

That the type of security being sold varies with the movement of the stock and bond market is readily apparent from the accompanying series of charts. Fig. 2 sets forth the monthly average price of ten high-grade public utility common stocks listed on the New York Stock Exchange, together with the monthly volume of new issues of public utility stocks as computed by the *Commercial and Financial Chronicle*. A distinct relationship between the two curves is immediately apparent and is particularly evident during the last three years. A steady rise in stock prices from June, 1928, through September, 1929, was accompanied by a series of successively higher peaks of monthly offerings and with the decline in prices which followed the volume of stock financing was abruptly and materially reduced. A subsequent rise in prices resulting in the peak of April, 1930, was closely followed by a marked increase in new offerings during the month of May. With continued poor business conditions and declining utility stock prices the volume of stock financing receded during the remainder of 1930 to lower levels than had prevailed for a similar period at any time during the past four years.

Bond prices and yields are much more stable than stock prices because of the fixed sum of money involved. During the period under review the average yield of ten high-grade utility mortgage bonds had a maximum deviation of only about 0.36 per cent. This, however, represented a wide swing and within these limits were good bond markets and bad. Fig. 3 illustrates the average price of ten utility mortgage bonds (the yields being equated to a 5 per cent bond maturing in 30 years in order to give a single price line) and also sets forth the volume of long-term bond and note financing for the four years from 1927 to 1930, inclusive.

It may be noted from this chart that the volume of long-term financing quite uniformly follows the trend of bond prices. Thus, when prices were high in 1927 and 1928 up to June, the monthly volume of financing was heavy. With the lower prices prevailing during the remaining months of 1928 and during 1929 up to October, the volume of new issues of this type was likewise reduced. Prices reversed their trend and mounted upward from 1929 until the latter months of 1930, when they again became somewhat weaker. During this period the volume of new issues increased materially and then declined as the year drew toward a close. The early months of 1931 have witnessed both higher prices and an increase in volume.

Short-term issues

Short-term note issues, as mentioned above, are used as temporary expedients pending the arrangement of permanent or long-term financing. Consequently, the volume of this type of financing is infrequently greater than that of either stocks or long-term bonds and is generally much smaller. However, periods of uncertainty do arise, as do times when it is difficult to arrange financing on a suitable price basis through either bonds or stocks. Here we find five major peaks during the four years. The first in September, 1927, followed a period of low prices for bonds and stocks. The next, in August, 1928, directly followed a sharp drop in bond prices and a cessation of new long-term issues. The third peak occurred during January, 1930, and was an aftermath of the stock market break in 1929. The final two peaks occurred during the middle and at the end of 1930 respectively and were brought about by declining stock prices, continued business depression and. in the latter case, by the demoralization of both the stock and the bond markets during last November and December. With the increase in January, 1931, of the volume of long-term financing the issuance of short-term notes immediately decreased.

From the above we have seen that the volume of financing through bonds and stocks varies roughly in line with variations in the general market for such securities. Fortunately these two markets do not generally move in the same direction at the same time, and it often happens that when the bond market is unsettled the stock market is reasonably healthy, and vice versa. This is shown in rough form by Fig. 4, which compares the trend of prices for the ten utility common stocks used as the basis for Fig. 2 with the average price for the ten bonds used in Fig. 3. The height of stock prices in 1929 coincided with the low point of bond prices, and while both rose together in the early months of 1930, bond prices remained the same, while stocks decreased materially in price as the year went on. Accordingly, it is often possible to arrange financing through the medium of stocks when it would be impossible to do so through the issuance of bonds or conversely.

Volume of new issues

Fig. 1 shows graphically how the volume of new offerings of various types varies from month to month and how the peaks of different types of securities do not often coincide. Only in one instance did the six major peaks of long-term bond offerings in 1929 and 1930 occur simultaneously with the peak of new stock issues, and the three largest monthly totals of short-term notes

took place in periods when either stock or long-term bond financing or both were at a low ebb. This illustrates clearly the advantage to the utility industry of its ability to make its offerings in sympathy with the prevailing trends of the various security markets and bodes well for successful financing, in fair weather and foul, by companies engaged in this line of endeavor.

It has been well proved by the depression year in 1930 that the public utility industry as a whole is on a sound basis and that its future progress, while retarded by a major depression, was not stopped. The decline in industrial sales was offset to a very large extent by increased domestic consumption and it is obvious that with an improvement in business conditions the growth of the utility industry will be actively resumed. New uses for gas and electricity, together with increased domestic and industrial loads, call for increased expenditures for plant and equipment. These needs, together with the requirements for refunding operations, call for the raising of a substantial volume of money during the year 1931. New construction expenditures have been estimated at from $800,000,000 to $1,000,000,000 for the industry as a whole for this year. It is impossible to predict definitely how this sum, plus the additional amounts required for refunding operations, will be provided, but there is little question that the utilities will be readily able to place their securities, of one type or another, in the hands of investors. General conditions seem to point toward an improved bond market for a number of months to come, and this would lead to the conclusion that a considerable portion of the new financing will be done through the medium of long-term bond issues. Improvement in business conditions appears to be in sight and this will in due course be reflected in an improved stock market, with the result that stock financing may prove to be an important means of raising new money during the latter part of this year.

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Power Factor Inducement Rates Have Economic Merit

An unusually thorough analysis of the economics of power-factor correction has been incorporated in a recent report of the N.E.L.A. rate research committee (Publication No. 15, March, 1931). It appears as a supplement prepared by Herbert A. Murphy, industrial service engineer Blackstone Valley Gas & Electric Company, Pawtucket, R. I. He assumes a 160,000-kva. system carrying a 112,000-kw. load at a power factor of 0.7, coincident demand of 100,800 kw. and requiring an investment of $45,600,000. Correcting the power factor to 0.8 by apparatus at large power customer locations would entail an added investment of $2,480,000, but would permit an added load capacity of 16,000 kw. The resulting net earnings available for surplus and/or rate reductions is computed to be $693,000, a return of 38.3 per cent on the increment investment. Operating expenses were assumed to have been increased by $382,000, or about 9.5 per cent. This is sufficient evidence of the economic advantage and justification of a preferential rate to induce the better power factor.

The author segregates the investment for large power purposes and arrives at the conclusion that the power factor affects the components of the system investment to the following extents: Generation, 13.6 per cent; distribution, 19.4 per cent; transmission, 5.8 per cent. It is also inferred that 35 per cent of the corrective investment could appropriately be installed at the generating station, but the balance would have to be located at the various load points.

In this case transmission and distribution components of the demand part of the investment are affected to the extent of 15 and 50 per cent respectively. The installation of correction at the delivery end of transmission lines to large distribution substations recovers 50 per cent of the total recoverable investment.

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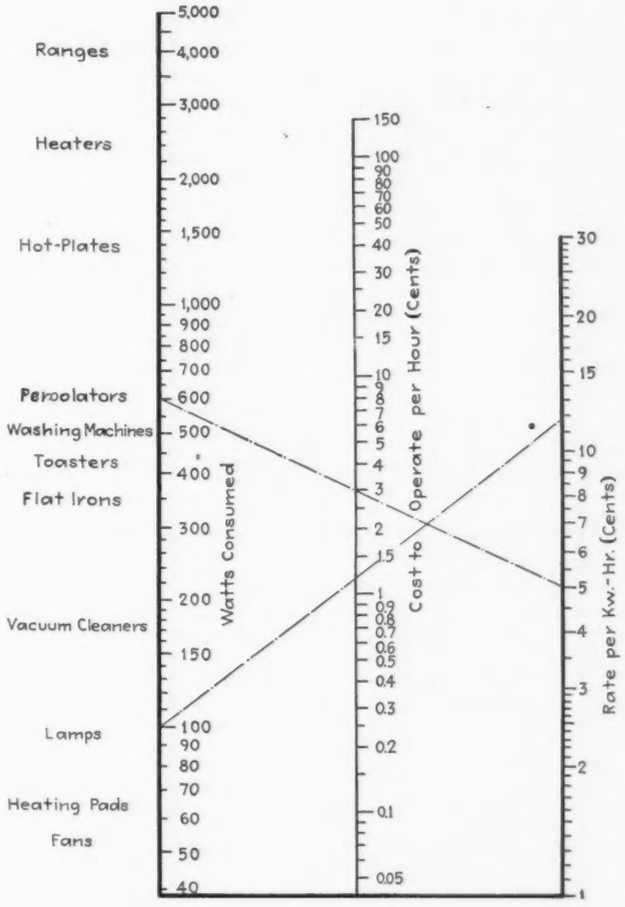
Appliance Operating Costs at a Glance



This chart, based upon that published in the March, 1931, *A. E. G. Progress* (Germany), offers a ready reference for quickly ascertaining the operating costs of various appliances. For the examples illustrated a 100-watt lamp operating at a 12-cent-per-kilowatt-hour rate would cost 1¼ cents per hour, while the 600-watt percolator energized under a 5-cent-per-kilowatt-hour rate would require 3 cents per hour. Values should of course be adjusted for probable use duration.

Simple Power Supply for Central Station Auxiliaries

By A. A. NIMS

Associate Professor of Electrical Engineering, College of Engineering, Newark, N. J.

Boiler room auxiliaries in modern central stations are usually motor driven, the alternating-current power being furnished by a house turbine set, auxiliary generators on the main generator shafts, or transformers connected to the generator bus or generator terminals. The present trend toward unit layout from boiler to high-voltage bus favors the individual generator or transformer bank for each turbine unit.

The auxiliary transformer bank connected to the generator terminals is simpler and cheaper than the auxiliary generator, but hitherto has been handicapped by the disadvantages of a fixed ratio between station or generator voltage and the auxiliary voltage. Modern operating practice requires that the auxiliary voltage be maintained regardless of system troubles that tend to bring down the main generator voltage.

It should therefore be of interest to know that by means of a simple arrangement, recently developed, transformers can be used to provide auxiliary power at practically constant voltage, irrespective of variations in the generator voltage due to busbar or external trouble.

The principle of the method may be seen from the single-phase diagram, Fig. 1, where the auxiliary bus voltage is shown as the difference between the secondary voltages of two transformers connected to the generator leads, one on either side of the generator reactor. Short circuits or excessive overloads will pull down both

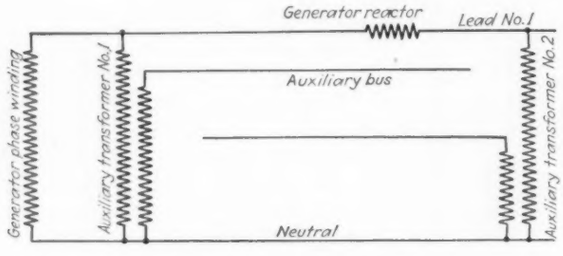


Fig. 1—Auxiliary power supply with two transformers showing only one phase of a three-phase system

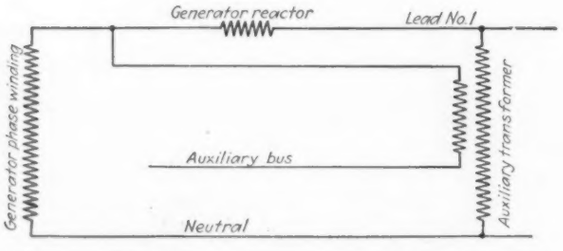


Fig. 2—Auxiliary power supply with one transformer showing only one phase of a two-phase system

secondary voltages, but the reactor drop between the two primaries increases with overloads and limits the range of variation of the auxiliary voltage. If an induction regulator giving ± 10 per cent control is applied to the auxiliary bus its voltage can be maintained practically constant from normal generator operation down to a sustained short circuit on the load side of the reactor, provided the transformer ratios are properly selected and the reactor is properly chosen.

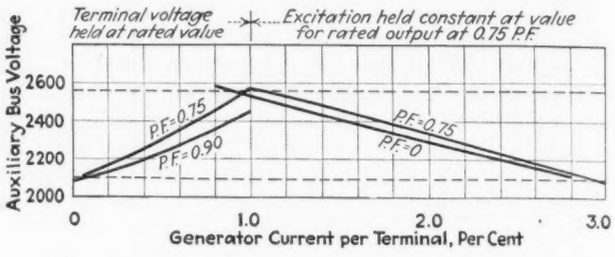


Fig. 3—Variation of auxiliary bus voltage with generator load

Dotted lines show limits of voltage range which a 10 per cent voltage regulator will correct to give a constant voltage of 2,200

The arrangement is extremely flexible, and for almost any ratio of either transformer a suitable reactor and corresponding ratio for the other transformer can be found. This may be carried to the extent of a 1 to 1 transformer at the generator terminals, or even eliminating it entirely, as shown in Fig. 2. In this figure, which also shows only one of the three phases, the secondary of the remaining transformer is shown connected to the generator terminals instead of to the neutral point, thereby permitting a three-conductor auxiliary bus, instead of using six conductors. A 1 to 1 insulating transformer can be used to isolate the auxiliary bus from the generator circuits.

If the transformer at the generator terminals is omitted, the reactor between generator and busbar will have a value of 5 per cent, which conforms with present practice. The transformer at the busbar may be omitted instead, but to obtain the same close regulation of auxiliary voltage a reactor of 33 per cent would be required, which is too high to be desirable.

To illustrate the steadiness of the auxiliary voltage under extreme operating conditions, consider a generator giving a voltage of 13,800 to neutral outside the lead reactor, and a nominal auxiliary bus voltage of 2,300. A total internal reactance of about 40 per cent and a lead reactor of 5 per cent will give a sustained short circuit outside the reactor of three times normal current, provided the excitation is held constant at a value giving rated load and voltage at a power factor of 0.75. If the transformer of Fig. 2 is given a ratio of 13,800/11,730, the auxiliary voltage, without correction by an induction regulator, and neglecting the inherent voltage regulation of the auxiliary transformer, will be as shown in Fig. 3.

With normal generator voltage maintained by automatic field control from no load to full load and with any power factor between 0.9 and 0.75 the maximum deviation of the auxiliary voltage from the normal of 2,300 will be 255, or about 11 per cent. If the gener-

ator is operating at normal load and voltage, with a power factor of 0.75, and a short circuit occurs at the outer terminal of the lead reactor, the auxiliary voltage will fall to about 2,070, or about 11 per cent below normal.

For more remote short circuits the reduction in auxiliary voltage will be less, as indicated by the curves, one for 0 power factor conditions and the other for a constant power factor of 0.75. Only when the short circuit is so remote that the current is less than rated value is there a tendency to exceed the normal operating range of variation, and this would be checked by the automatic voltage control of the main generator.

If the generator is operating at normal load and voltage, with a power factor of 0.90, when a short circuit occurs at the busbar, a sustained current 2.8 times normal will flow, provided the excitation is maintained constant. This will allow the auxiliary voltage to fall off to about 1,930, or 16 per cent low. Voltage regulators may be arranged to control excitation on short circuit to produce a definite short-circuit current, so that a sustained short-circuit current of three times normal may be assured at all times and the auxiliary voltage kept within the limits previously established.

The variation in the auxiliary voltage may be made less than ± 11 per cent by increasing the sustained short-circuit current above three times normal. For ± 10 per cent variation the short-circuit current should be 3.31 times normal; for ± 9 per cent, 3.67 time normal, and for ± 8 per cent, 4.17 times normal. It is therefore possible, by means of a standard induction regulator, to maintain a constant auxiliary voltage, provided a larger short-circuit current can be permitted.

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Experience with Wood-Pole Construction

An editorial, "Wooden Crossarm Braces Deserve Wider Consideration," appeared on page 487 of the March 14 issue of ELECTRICAL WORLD. This editorial referred to the experience of the Public Service Company of Northern Illinois as given in a paper "Recent Developments in Wood-Pole Transmission Line Insulation." The following is quoted from the editorial:

> . . There were 33 cases of serious pole and arm damage per 100 miles due to splintering by lightning on the steel-brace construction and none whatever on the wooden-brace construction.

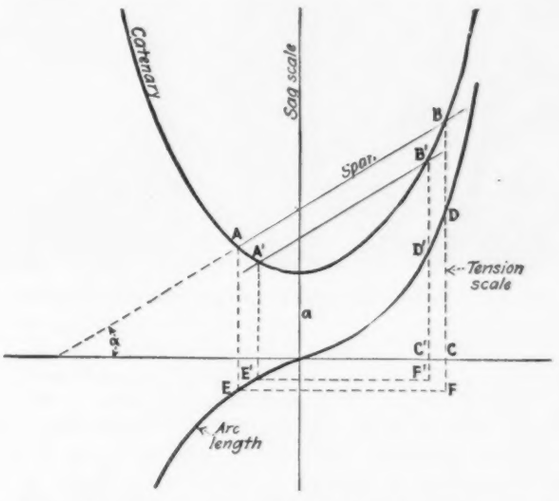
This statement refers to Table III of the paper, which showed the number of cases of serious pole and arm damage due to lightning on the old type of construction as 33, and as three on the wooden-brace construction. It has been called to the attention of ELECTRICAL WORLD that in the paragraph following Table III it was pointed out that there was considerable minor splintering with the new type of construction. It has further been emphasized that consideration of the data indicates that the serious damage due to splintering on either type of construction is about the same when the relative exposures of the two types are considered.

An abstract of "Recent Developments in Wood-Pole Transmission Line Insulation" appears in this issue of ELECTRICAL WORLD, page 780.

One Catenary Serves All Sag Problems

Certain properties of the catenary make it possible to draw one accurately to large scale and ascertain most of the sag-temperature data for line design, at least for the preliminary analysis. Hugo Grob in *Elektrotechnische Zeitschrift* points out that it is only necessary to select the proper portion of this standard catenary to fit specific conditions of span length, relative elevations of supports, sag and tension. This is merely a matter of adjusting the linear scale of all measurements to reconcile the span intercept on the curve with the actual span length. Also, it is known that the longitudinal tension at any point of a catenary is equal to the weight of a length of wire measured by the ordinate of that point of the curve.

Thus assume that the conductor is supported from two points, A and B, 300 ft. apart along an incline of α.

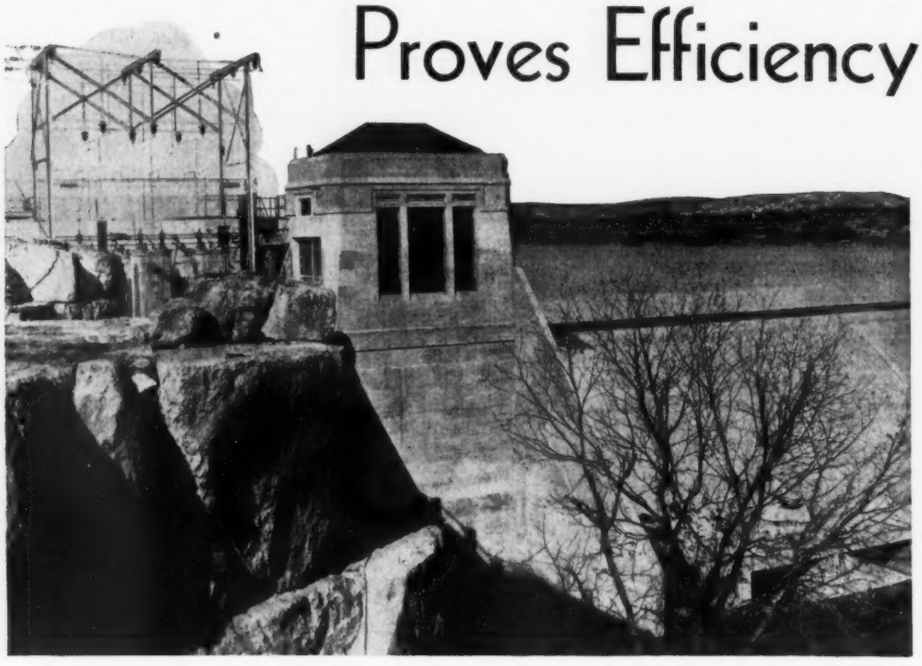


The feet of sag below the A level can be determined by applying the scale of AB to the vertical sag scale. Also the maximum tension (at B) is the weight of BC feet of wire. If greater tension and less sag are desired, the line AB is shifted to A^1B^1 or such other location as gives the desired sag and tension when measured by the new linear scale fixed by the new length of A^1B^1.

Temperature influence on sag and tension can be ascertained by incorporating the curve for catenary length from the equation $s = \frac{a}{2}\left[e^{\frac{x}{a}} - e^{-\frac{x}{a}}\right]$. The length of wire between the two points of support A and B is DF measured by the same scale as AB. If temperature changes the length, then AB will have to be shifted say to A^1B^1 until it results in D^1F^1 giving the new length to the new A^1B^1 scale. Sag and tension can then be redetermined as before.

In plotting both curves it is convenient to let $e^{\frac{x}{a}}$ assume a series of integral values, choose a as unity and ascertain x as the natural logarithm of $e^{\frac{x}{a}}$ and finally get y from $y = \frac{a}{2}\left[e^{\frac{x}{a}} + e^{-\frac{x}{a}}\right]$ by simple arithmetical procedure.

Adjustable-Blade Turbine Proves Efficiency at Reduced



Adjustable-blade unit in this plant operated 97 per cent of the time during 1930
(Lake Walk)

By C. L. DOWELL
Central Power & Light Company, San Antonio, Tex.

THE rescue of 563,000 kw.-hr. that would have been lost by a fixed-blade turbine is the record for 1930 of the Kaplan automatic adjustable-blade unit installed in the Lake Walk hydro station of the Central Power & Light Company.* And as far back as the records go (twenty years) the first nine months of 1930 are among the lowest in stream flow. This period of low water gave the Kaplan turbine an excellent opportunity to demonstrate its economy.

Lake Walk plant is the lower of two hydro stations on the Devil's River. Because of the necessity for condensing water at a 20,000-kw. steam station farther down the stream this plant must operate practically continuously. The upper hydro plant—Devil's Lake—is under no such rigid requirement and may operate, within obvious limits, only during periods when accumulated water allows efficient loading. This plant contains a fixed-blade unit which has not the sustained efficiency of the Kaplan turbine at lower loads.

The operating record shows the mean average stream flows of the river and the energy productions of the two plants for the months of 1929 and 1930. It shows also the total hours' operation of each plant. From the figures of total production and operating hours are derived the average loads of the two plants, which show the much lower loading of the Kaplan unit. At this average load the unit has an efficiency of 89 per cent. A fixed-blade turbine has an efficiency of only 79 per cent at this load. The difference between the two efficiencies indicates the saving of energy which, as stated, amounted in 1930 to 563,000 kw.-hr.

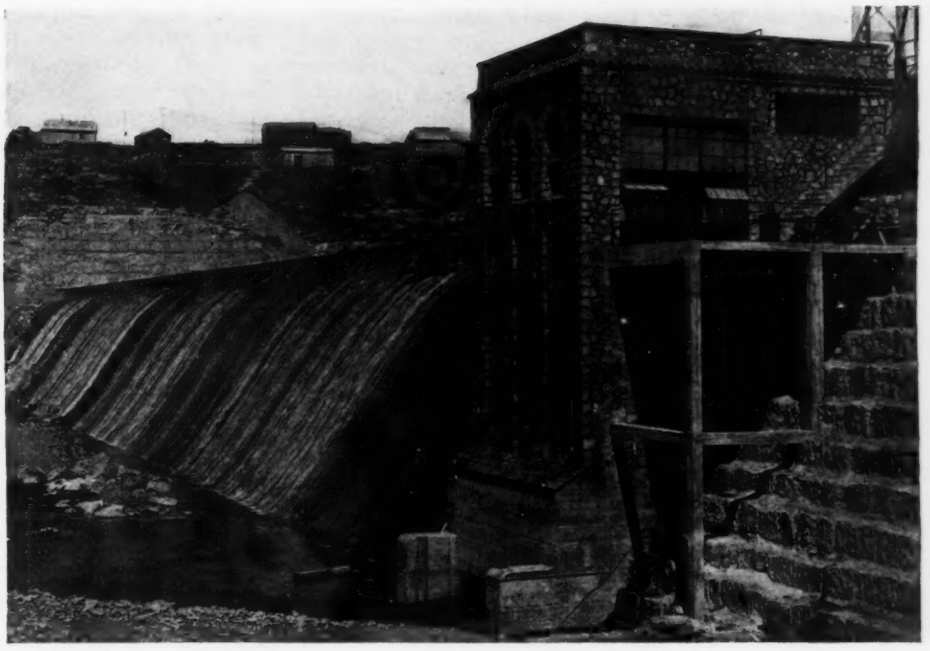
In order to explain some apparent inconsistencies in the data tabulated the operating conditions on several occasions should be noted. The low production figures for May at both plants is due to recovering the storage which was let out in the latter part of March and first part of April to help the Lower Rio Grande Valley irrigation district. These periods were as follows: March 24 to 31, average of 450 sec.-ft. continuous instead of normal flow of 240 sec.-ft. April 9 to 18, average of 415 sec.-ft. continuous instead of the normal flow. It is estimated that a total of 8,928 acre-ft. in

**See "Electrical World," April 5, 1930.*

Comparison of Fixed Blade and Adjustable Turbine Operation

	Mean Average Flow U.S.G.S. Report		Devil's Lake, Kw.-Hr. (Fixed-Blade Turbine)		Lake Walk, Kw.-Hr. (Kaplan Turbine)	
Month	1929	1930	1929	1930	1929	1930
Jan.	246	290	367,100	544,900	.....	369,000
Feb.	322	272	655,200	525,400	.....	338,000
March	323	302	495,400	415,300	.....	290,000
April	186	367	462,300	586,600	.....	500,000
May	434	170	492,600	188,700	.....	145,000
June	632	556	623,900	529,200	.....	410,000
July	768	328	797,100	591,400	622,000	445,000
Aug.	350	252	715,400	438,200	573,000	352,000
Sept.	267	234	438,300	398,600	303,000	269,500
Oct.	306	5,550	527,100	886,900	375,000	740,700
Nov.	295	...	555,400	1,157,700	402,000	950,400
Dec.	294	...	494,300	1,115,800	367,000	827,000
Total	...	...	6,624,100	7,378,700	2,642,000	5,636,600
Hours operated.....			6,809	5,785	4,416	8,456
Average load (kw.).....			990	1,275	600	665
Efficiency of stationary blade unit, per cent.....			85	90	76–78	79
Efficiency of Kaplan unit, per cent.....			..	..	89	89
Gain in efficiency by use of Kaplan turbine, per cent					**11–12**	**10**
Gain in kilowatt-hours by use of Kaplan turbine....					**290,000**	**563,000**

Loadings



Fixed-blade turbine in this plant operated 66 per cent of the time during 1930

(Devil's Lake)

excess of normal flow was let out and this pulled down the head 15 ft. in Devil's Lake at the maximum low point.

In June the flashboards washed out, causing a reduced head at the Devil's Lake plant of 5 ft. for the time required to replace these boards. In October during the flood these boards again washed out. At this time there was 73,000 sec.-ft. flood at Devil's Lake hydro and the peak at the gaging station downstream showed 85,000 sec.-ft. Due to continued high water these flashboards were not replaced until some time in November.

During December, when both plants operated practically 24 hours a day, the ratio of the output is almost exactly in direct proportion to the net head on the two plants. On the other hand, during periods of low flow, when Devil's Lake operated only part time, it was necessary to operate Lake Walk continuously.

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Flexible Service Attained in Wiring Building

In designing the wiring of a new 22-story office building at 75 Federal Street, Boston, James Wilkinson & Company, electrical engineers, faced the problem of providing a flexible layout without undue use of material. The arrangement of the floors contemplates their use by a large number of small tenants, for the most part. The wiring installation was therefore adapted to meet these conditions by the adoption of duplicate feeders for each group of floors, with cross-connections between the distributing panels on each floor and the use of three-wire branches from metering panels to bays.

Energy supplied to the building from the Boston Edison company's three-wire,* 115-230-volt direct-current downtown network through three 1,500,000-circ.mil feeders tied into two separate sections of the underground system. Two feeders will supply the estimated maximum demand of the building with a third out of service. The main distribution board is of the dead-front, steel-panel type with two-pole circuit breakers for the main service connections and knife switches for building risers.

Typical feeder risers are grouped in pairs, using one feeder for an average of four floors in one-half of the building. Riser conduits are run in two chases, with wiring closets at each floor. These closets house the

Each riser serves four floors

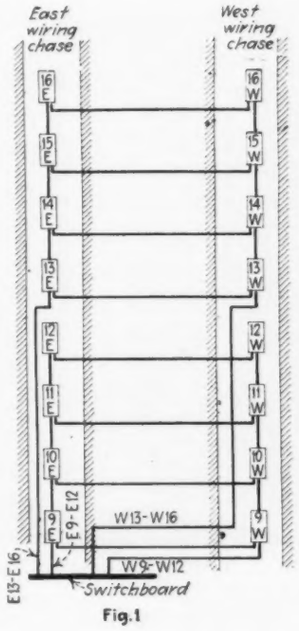

Fig.1

Panel boxes are cross-connected for greater reliability and improved voltage regulation

Loads per bay are balanced on three-wire branches

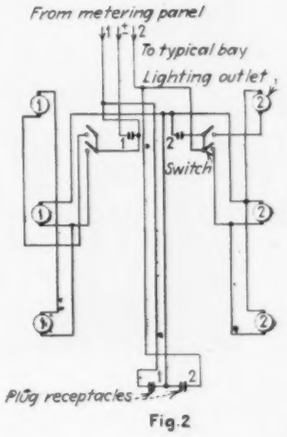

Fig.2

distributing and metering panels and magnetic contactors for remote control of certain heavy-duty lighting and power circuits. Horizontal cross-connections between panels on each floor increase the flexibility and reliability of the service by establishing a complete building distribution network. From panels to lighting outlets and plug receptacles in bays distribution is by three-wire circuits with a common neutral. This, of course, permits a saving of one branch wire, a reduction of more than 30 per cent in branch conduit on account of reduced size required, and a saving of about 25 per cent in panel and cabinet material. Load balancing on individual branches is also effected on a most satisfactory basis.

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2,000-Kw., 75-Ton Furnace Anneals Large Castings

By A. G. HOTCHKISS

General Electric Company, Schenectady, N. Y.
Industrial Heating Engineering Department,

Every year larger single-unit steam turbines and electric generators are being built and installed. As the size of these units increases the problem presents itself of annealing and heat treating the corresponding larger parts.

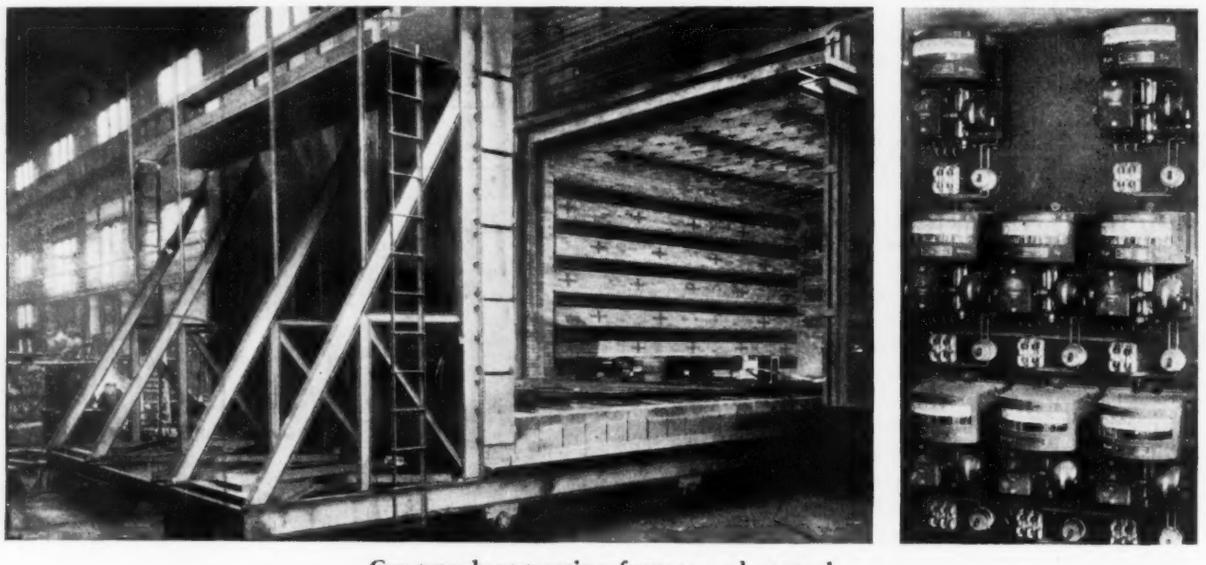
To handle the heat treatment of these large castings and fabricated structures properly the General Electric Company has installed at the Schenectady plant a 2,000-kw. car-bottom type electric annealing furnace with a maximum loading capacity of 75 tons. The furnace not only handles the largest structures now heat treated, but is of sufficient size to accommodate the larger machines of the future.

The car, which also carries the door or bulkhead, has a loading space of 27x17 ft. and can be loaded to a height of 12 ft. All work is supported on the car floor by heavy rails laid crosswise, thus allowing good heat circulation. The car, which with a full load weighs approximately 125 tons, is supported by twenty wheels equipped with roller bearings, and is pulled in and out of the furnace by a drum and cable arrangement with an electric drive.

The furnace roof is of the flat arch construction, using tile suspended by alloy castings and bolts from I-beams across the top. The walls are of standard furnace construction, a light-weight refractory being used throughout except in the car floor.

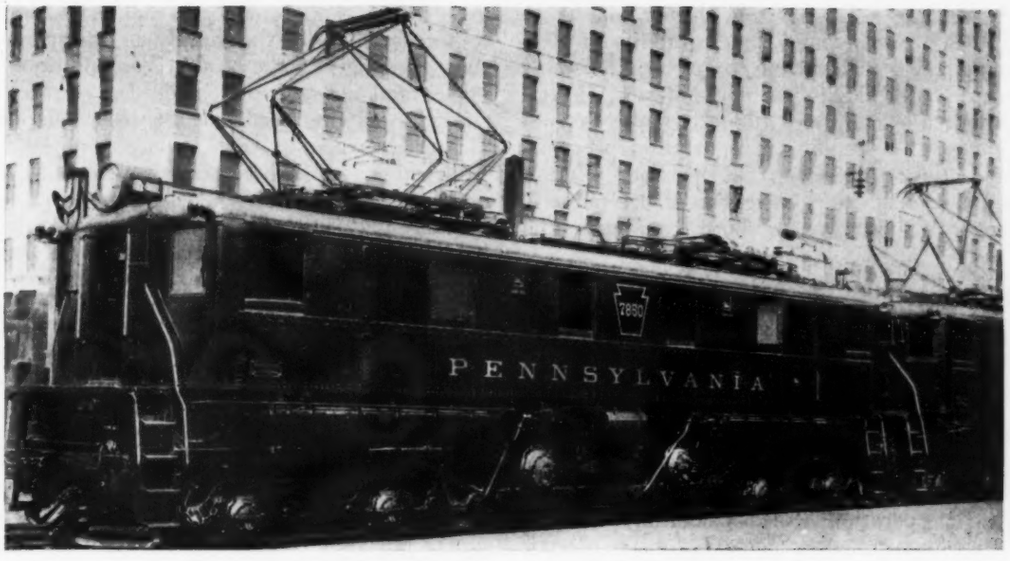
The heating units which dissipate the 2,000 kw. of energy are of the nickel-chromium ribbon resistor type and are located on all walls and ceiling of the furnace and bulkhead and floor of the car. Floor units are protected by cast-alloy hearth plates. All power is transmitted to the car through plug connections automatically made and broken when the car is run in place or removed. These heating units are divided into eight zones or sections, each of which is controlled independently by a Bristol temperature controller. One instrument controls the bulkhead unit, another the rear wall; the side walls are each divided into a top and bottom section and the floor and roof units are separate sections. The distribution of heat is therefore under perfect control of the operator at all times and it has been found possible to maintain exceptionally even temperature in all parts of the furnace.

The use of light-weight refractory has shortened considerably the heating and cooling cycles; in fact, with smaller loads of approximately 30 tons, the heating rate is controlled by increasing the temperature at intervals on the controlling instruments. Even with the controlled heating rate, a load of 30 tons with a cold car and furnace has been heated to 850 deg. C. in twelve hours. The natural rate of cooling can also be increased by means of a series of openable holes close to the car floor, with similar openings located in the roof, to allow for a complete circulation of air through the furnace. The openings in the roof are opened and closed from the operator's booth by a chain and sprocket connection.



Car type heat-treating furnace and control

A maximum temperature of 1,650 deg. F. is obtainable with this 550-volt, 2,000-kw., three-phase installation. This control panel is arranged so that one Bristol pyrometer controller functions for each of eight heating element sections.



Benefits that Warranted Pennsylvania Electrification

As observed in the editorial on page 574 of the March 28 issue, the National Coal Association has challenged the Pennsylvania Railroad to justify the electrification of its railroad. Since the coal association, by its reported statements, is attacking the economic justification of industrial electrification in general, the "Electrical World" has asked the Pennsylvania Railroad to explain why it chose to supplant steam with electric operation, and also why the National Coal Association's criticism is unjustified.

ELECTRIFICATION of the Pennsylvania Railroad line between New York and Washington was undertaken as the most economical and efficient way in which to handle the increasingly heavy traffic on this part of the railroad. This decision was reached three years ago, at which time General Atterbury pointed out the following factors which influenced the Pennsylvania Railroad's decision to electrify:

"1. The greater economy of electric traction as compared to steam operation in dense traffic territories.

"2. The growth of the Southern passenger business.

"3. The increasing density of both freight and passenger business on our Eastern lines and the probability that in the future more rapid movement would be required.

"4. The desirability of utilizing the advantages of electric traction in connection with the construction of our new passenger terminals at Philadelphia and Newark.

"5. The desirability of building a locomotive that would meet the requirements from the standpoint of weight of train, speed and reliability that we believe will have to be met in this territory in the next twenty years."

In connection with the announcement of the Pennsylvania's electrification program on October 31, 1928, General Atterbury said:

"The authorization of the board of directors to inaugurate this work follows exhaustive studies of the whole industrial and transportation situations in the eastern part of the country, including the terminal developments already under way or projected for Philadelphia and Newark. While this analysis was worked out in detail on the basis of the traffic estimated for the year 1935, the probability was not lost sight of that by 1950 the metropolitan area around New York would extend to New Brunswick on the west and well out on Long Island on the east and contain 30,000,000 people, and that there would be similar development in other cities.

"The system adopted will be such that it will, by the simple addition of increased power and increased rolling stock, handle a movement of any magnitude which it is possible to handle over the existing tracks and at such speed, within the bounds necessary for safe operation, as the demands of the traffic may require from time to time.

"By the method of operation proposed we expect eventually to reduce the number of freight trains 50 per cent for a given car movement and increase the speed to any reasonable extent required. This of itself provides for a 100 per cent increase in capacity in so far as freight movement is concerned."

In addition to the necessity for electric operation through the Hudson tunnels, and the desirability of electrification in connection with the passenger terminals now under construction at Philadelphia and Newark, electric operation through the Baltimore tunnels is also considered a highly desirable step in transportation progress. Electrification of the Baltimore tunnel operation will not only mean improvement in passenger comfort but will greatly increase the capacity of both passenger and freight lines.

It is true that electrification of the Pennsylvania lines will eliminate a certain amount of coal consumption in locomotives now using steam power. This loss will be largely counterbalanced, however, by the consumption of coal by electric power plants furnishing the necessary electricity to operate the Pennsylvania's electrified system. Since the electrification is expected to bring new and increased traffic to the Pennsylvania lines, it is logical to assume that the amount of power required by the Pennsylvania's electric operation will considerably increase the amount of coal consumed in the generation of electric power in that territory.

It is also entirely conceivable that if, as the National Coal Association states, "industries in the same section will likewise turn to that source of energy (electrical power) instead of generating their own power by the use of coal," additional large industries may be attracted to this section by the supply of cheap electric power, thus bringing into the territory an additional demand for power and consequently a similar increase in the consumption of coal needed to generate this electricity.

Any decrease in coal tonnage on the Pennsylvania Railroad caused by a switch from steam to electric power on the part of industries located along its lines will also be largely offset by the elimination of all expense for hauling coal for its own locomotive use, due to the substitution of electric for steam power.

Power plants which will supply the Pennsylvania Railroad with electric current will probably be located along the railroad, and it is a natural assumption that the Pennsylvania Railroad will haul a very considerable portion of the coal tonnage used by these plants.

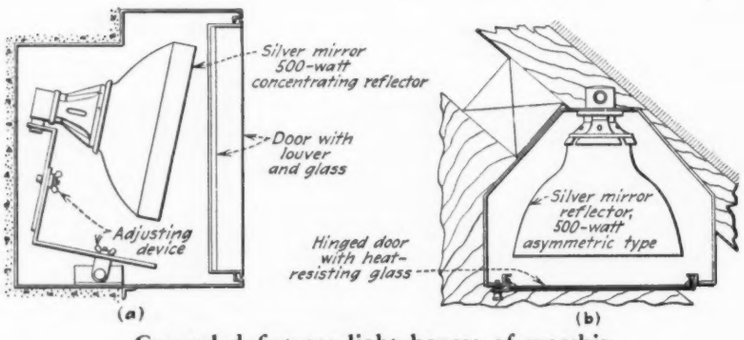
The coal industry has benefited rather than suffered from the use of electricity by railroads. The use of the electric light, replacing candles, kerosene and gas, has increased the consumption of coal for electric light and power purposes tremendously. Railroad stations, offices, shops and cars are lighted by electricity. Shop machinery is almost entirely operated by electricity. Signal systems and scores of other railroad operations are today powered by electricity. All of this current requires coal to generate it.

▼ ▼ ▼

Direct Illumination Without Visible Fixtures*

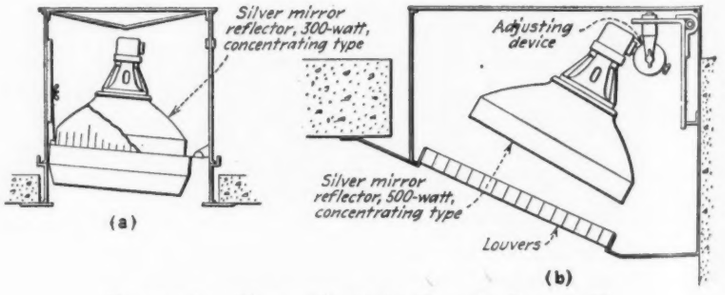
In the Church of the Heavenly Rest, Fifth Avenue, which is done in Gothic architecture, the nave, 48x150 ft., with a ceiling height of 82 ft., is lighted by units in the side walls from which rays are projected across and diffused from opposite walls. The arrangement is shown in (a). Each unit consists of a recessed metal box containing eight concentrating type reflectors for 500-watt lamps. A light amber-tinted glass and combination horizontal and vertical metal louvers are mounted in the hinged doors. Each reflector is mounted on a swivel joint in the box to allow for adjustment.

A most practical yet comparatively inexpensive installation has been completed in the Church of the Holy Nativity, which has a 30x80-ft. nave with a ceiling supported by crossbeams. The lighting is effected by fixtures partially concealed by the beams, as shown in (b). These 500-watt units are mounted 24 ft. above the floor. The light is directed forward and toward the center of the church for a uniform distribution over the plane of the pews. The ceiling is in semi-darkness.



Concealed fixtures light houses of worship

In Temple Emanu-El, Byzantine style of architecture, in which the temple measures 95x195 ft. with a ceiling height of more than 100 ft., it was desirous to keep the ceiling and upper walls in semi-darkness. This was accomplished by direct lighting with fixtures mounted in the ceiling, as shown in (a). Forty of the 300-watt concentrating type reflectors in the specially constructed metal housing mounted in the ceiling give a satisfactory illumination. All reflectors are adjustable. The 500-watt concentrating type reflector units which light the chancel in Temple Emanu-El are shown in (b).



Recessed ceiling units light Temple Emanu-El

*Abstracted from a paper, "Lighting Without Fixtures in the House of Worship," by Lester H. Graves, presented before the Illuminating Engineering Society.

Facts and Ideas on Sales

What the Dealer Expects of the Manufacturer and Wholesaler

By FRANK E. BOYD
Secretary-Treasurer Pacific Electric Motor Company, San Francisco, Calif.

First—Make it possible for the dealers to handle the sale of motors, control, repair parts, transformers, lamps, industrial heating, wiring supplies, etc., with class A customers on a basis that will return us our overhead and a reasonable profit. This would be sound economics.

Second—The wholesalers should establish a classification of trade similar to that of the manufacturer.

Third—The manufacturer should be more discriminating about the B classification and recognize the fact that dealers cannot avoid handling much of this class of business even if they would.

Fourth—The manufacturers should be more discriminating about the appointment of motor and lamp dealers and eliminate those who are not now measuring up to specifications.

Fifth—The manufacturers should conduct repair shops on a basis consistent with the rest of their commercial policies, and in a way that will not be detrimental to the interests of dealers selling motors, lamps and supplies.

Sixth—On the principle that two heads are better than one, it might be worth while conferring with a limited group of representative dealers in the interest of acquiring more facts and ideas to develop further the sales policies of the manufacturers and wholesalers.

Seventh—We neither seek nor want paternalism, but we do ask that manufacturers be considerate of our broad functions. That this may be the better accomplished we urge that policies be co-ordinated and administered so that we may develop with the balance of the industry.

IT HAS been said that constructive thinking regarding commercial problems has lagged behind many other phases of our complex commercial life. If this is a fact it would appear that it does not apply to the volume of goods sold, for there are indications today that possibly the present business depression is a result of the public having been oversold on many things.

On the other hand, it would seem that there has been a lack of clear thinking and consistency in the formulation of the policies employed by sales organizations. It would appear that expediency has been the guiding factor rather than an analysis of the facts. In the electrical business there has been some recognition of the situation in the improvement which has taken place in the relations between the wholesalers and the manufacturers, and the methods employed by the manufacturers in connection with those things which they naturally and logically sell direct to users.

The manufacturers have also given a fine exhibition of constructive thinking by the improvement which has been made in their policy of selling motors, and today the industry is enjoying greater stability in this line than at any time in its history.

The electrical dealers and contractors have also been doing better thinking in recent years. This is especially true since the motor section of the Electragists was formed and given recognition at the St. Louis and Chicago conventions in 1927 and 1928, respectively. The exchange of ideas which took place at these two conventions has emphasized a need for the basic facts pertaining to our operations and the necessity of making them available for the manufacturers and wholesalers, as well as ourselves.

In establishing margins too little, if any, consideration has been given to the dealer's cost of doing business. The manufacturers have always thought of margins in terms of competition rather than economics. This is as much the dealer's fault as the manufacturer's, because he has never presented the facts. The facts of the situation, however, have driven good men out of the business and kept others away, which may to an extent explain why the dealers have not been the strong, constructive selling force they should have been.

On motors we are allowed 17 per cent discount, which is equivalent to a mark-up of 20.5 per cent of cost. On lamps a $5,000 A agent can only secure a mark-up of 16.2 per cent of cost when selling to a customer on a $300 E contract, and less as the contract becomes larger.

On transformers we can only secure a mark-up of 10.35 per cent of cost.

If the situation is given any real thought, certainly no manufacturer or wholesaler would expect the dealers to come out on the right side of the ledger when asked to sell items which afford the dealer a gross discount of only 10 per cent. Even in a very simply constructed business the overhead would, in all likelihood, exceed this amount. In spite of this, the sales departments of the manufacturers still look upon a 10 per cent discount as fairly lucrative, and even today an analysis of their lines will show 10 per cent is common on many items. In the past the sales department of the manufacturer has not, normally, had to deal with the dealer's cost of doing business, but the time has now arrived when it must think more in these terms if it wishes to look to the dealers to do a better job of distribution.

The situation really demands the attention of the best analysts and executives in the industry; men who know what it costs them to do business, and who have an appreciation of what is reasonable for others. I present, therefore, the accompanying facts and data taken off our books, with the hope that they may be of value to the industry in paving the way for further improvements in commercial policies.

Motors and control are sold by dealers usually one or

Tables I and II—Record of Total Sales During 1929 and 1930

Based on 300 Working Days per Year

1929		
7,537 charges, net sales (including cash sales)	...	$403,194.30
Average sale	...	53.22(A)
Average number of sales per month	628	
Average amount of sales per month	...	33,599.50
Average number of sales per day	25	
Average amount of sales per day	...	1,343.00
Departmental Segregation of Sales		
Wiring Department		
592 charges (*b*), net sales	...	$190,713.13(B)
Average sale	...	322.16
Average number of sales per month	49	
Average amount of sales per month	...	15,892.76
Average number of sales per day	2	
Average amount of sales per day	...	635.71
Shop Department		
2,174 charges (*c*), net sales	...	$64,243.78(*c*)
Average sale	...	29.55
Average number of sales per month	181	
Average amount of sales per month	...	5,353.65
Average number of sales per day	7	
Average amount of sales per day	...	214.15
Sales Department (Supplies and Equipment)		
(F) 4,771 charges (*d*), net sales	...	$145,392.18(*d*)
Average sale	...	30.47
Average number of sales per month	398	
Average amount of sales per month	...	12,116.00
Average number of sales per day	16	
Average amount of sales per day	...	484.64

1930		
8,276 charges, net sales	...	$291,889.10
Average sale	...	35.30
Average number of sales per month	689	
Average amount of sales per month	...	24,300.00
Average number of sales per day	28	
Average amount of sales per day	...	872.00
Departmental Segregation of Sales		
Wiring Department		
496 charges, net sales	...	$129,616.13
Average sale	...	261.00
Average number of sales per month	41	
Average amount of sales per month	...	10,800.00
Average number of sales per day	2	
Average amount of sales per day	...	432.00
Shop Department		
1,889 charges, net sales	...	$58,149.06
Average sale	...	30.80
Average number of sales per month	158	
Average amount of sales per month	...	4,850.00
Average number of sales per day	6	
Average amount of sales per day	...	194.00
Retail Sales Department		
5,891 charges, net sales	...	$101,829.35
Average sale	...	17.30
Average number of sales per month	490	
Average amount of sales per month	...	8,490.00
Average number of sales per day	20	
Average amount of sales per day	...	340.00

	No. Charge Accounts	Per Cent of Total No.	Volume of Sales	Per Cent of Total Volume
$1,000.00 and over	60	6.5	$296,059.37	78.70(*e*)
500.00 to 1,000.00	31	3.3	21,251.94	5.67
100.00 to 500.00	186	20.0	42,597.82	11.20
50.00 to 100.00	123	13.2	8,553.63	2.23
Under 50.00	529	57.0	8,241.69	2.20
Total (cash sales excluded)	929	100.0	$376,704.45	100.00

Table III—Cost per Sale

	Number of Sales	Overhead	Cost per Sale
1929			
All departments	7,537	$97,221.69	$12.90
Wiring	592	33,337.72	56.30
Shop	2,174	24,146.62	11.10
Retail	4,771	38,957.85	8.16
1930			
All departments	8,276	85,955.97	$10.40
Wiring	496	29,225.03	59.00
Shop	1,889	21,488.99	11.40
Retail	5,891	34,382.39	5.84

The data in Tables I, II and III show some significant facts of interest:

(A) The small value of our average sale.

(B) That the wiring department produces 47 per cent of our dollar volume, with but 8 per cent of our orders. (*b*)

(C) That the shop handles almost 30 per cent of our orders, but produces only 16 per cent of our dollar volume. (*c*)

(D) That the sales department produces 36 per cent of our dollar volume, but it involves 64 per cent of our orders (*d*) to do this, and, as you will see later, business is conducted at a loss.

(E) Our business is not different from that of the manufacturer and wholesaler, in that the large share of our dollar volume comes from a very few clients. On the other hand, we have to serve a great many clients for a mere pittance of our dollar volume.

This service extended to a large number of small customers accounts for a considerable amount of our expense. We recognize, however, that some one in the industry has got to serve the large number of small customers, and that, apparently, this is our responsibility.

If this is a fair assumption, then the manufacturers and wholesalers should have the situaation in mind when they establish discounts for us on the products that pass through our hands. The figures should make apparent that it is not altogether sound to theorize that there is "a large field in which the motor dealer, if he performs his proper functions, can enjoy a large volume at maximum profits."

(F) The large number of transactions handled by the sales department, in comparison with the volume done by the other departments, makes clear why it costs so much to handle such business.

two items at a time and considerable engineering is involved in selecting the proper equipment and making the application. This accounts for a great deal of the overhead expense involved. The only control items on which we can show a profit are those which, because of the size of the business and our financial resources, we are able to buy in quantities. However, even in these items we are not convinced that 2.4 per cent net profit is good business where the dollar value of the sale is small. Most of the dealers cannot buy in maximum quantities on any considerable percentage of their purchases, therefore it is obvious where they come out.

Other typical analyses

For example, let us take a motor transaction, as follows:

Selling price		$100.00	
Cost	$83.00		
Gross mark-up			$17.00, or 20.5 per cent of cost
Overhead 27.1 per cent of cost	22.50		
Gross cost		$105.50	
Loss		$5.50	

It is also interesting to analyze two control items as follows:

First, a set of the little heater elements for magnetic switches, of which we sell, literally, hundreds, mostly a set at a time.

Selling price		$1.00	
Cost (buying at best quantity price 17 and 7½ per cent off)	$0.768		
Gross mark-up			$ 0.232, or 30.3 per cent of cost
Overhead 27.1 per cent of cost	0.208		
Gross cost		$0.976	
Net profit		$0.024	or 2.4 per cent of selling price

Second, take a standard switch, of which we sell many:

Selling price		$16.00	
Cost (buying at best quantity price 17 and 7½ per cent off)	$12.28		
Gross mark-up			$3.72, or 30.3 per cent of cost
Overhead 27.1 per cent of cost	3.33		
Gross cost		$15.61	
Net profit		$0.39	or 2.4 per cent of selling price

One-half of our control purchases cannot be bought in quantities, therefore they take only 17 per cent discount, and, like motors, are handled at a loss.

Many repair parts items sell for as low as 15 and 20 cents each, and practically every sale, whether large or

Tables IV and V—Overhead Expense, 1929 and 1930

1929

Includes salaries, depreciation, power, telephone, rent, office supplies, sales, advertising, auto expense etc. Each item of expense is prorated to each department according to the benefits it receives.

	Amount	Per Cent
Wiring	$29,212.72	35.6
Shop	21,146.62	25.7
Sales	31,157.85	37.9
Rent	704.50	0.8
Total	$82,221.69	100.0

57 per cent of our overhead is salaries for eighteen employees.

43 per cent of our overhead is all other expense.

Overhead in Per Cent of Sales

(This shows average discounts needed to break even)

	Sales	Overhead	Per Cent of Sales
Wiring	$190,713.13(A)	$29,212.72	15.3
Shop	64,243.78	21,146.62	32.9
Sales	145,392.18(A)	31,157.85	21.4
Rent	2,845.21	904.50	24.7
Total	$403,194.30	$82,221.69	(B)20.4

Overhead in Per Cent of Cost

(This shows mark-up necessary to break even)

	Cost	Overhead	Per Cent of Cost
Wiring	$137,839.12	$29,212.72	21.2
Shop	37,434.10	21,146.62	56.5
Sales	115,104.83	31,157.85	27.1
Rent	200.36	704.50	351.0
Total	$290,578.41	$82,221.69	(B)28.3

1930

	Amount	Per Cent of Total
Wiring	$26,235.33	34.2
Shop	19,441.88	25.3
Sales	30,288.17	39.5
Rent	790.59	1.0
Total	$76,755.97	100.0

Overhead in Per Cent of Sales

	Sales	Overhead	Per Cent of Sales
Wiring	$129,616.13	$26,235.33	20.3
Shop	58,149.06	19,441.88	33.4
Sales	101,829.35	30,288.17	29.8
Rent	2,294.56	790.59	34.5
Total	$291,889.10	$76,755.97	26.3

Overhead in Per Cent of Cost

	Cost	Overhead	Per Cent of Cost
Wiring	$91,974.61	$26,235.33	28.8
Shop	35,790.88	19,441.88	54.4
Sales	75,283.83	30,288.17	40.3
Rent	227.13	790.59	348.0
Total	$202,376.45	$76,755.97	37.9

Table VI—Combined 1929 and 1930 Overhead Percentages

Prorating expense according to 1931 percentages

	Amount	Per Cent
Shop	39,744.41	25
Sales	44,642.18	35
Rent	1,589.78	1
Total	$158,977.66	100

Overhead in Per Cent of Sales 1929 and 1930

	Sales	Overhead	Per Cent of Sales
Wiring	$320,329.26	$62,001.29	19.35
Shop	122,392.84	39,744.41	32.43
Sales	247,221.53	55,642.18	22.50
Rent	5,139.77	1,589.78	31.00
Total	$695,083.40	$158,977.66	22.90

Overhead in Per Cent of Cost 1929 and 1930

	Cost	Overhead	Per Cent of Cost
Wiring	$228,913.73	$62,001.29	27.1
Shop	73,224.98	39,744.41	54.2
Sales	190,388.66	55,642.18	29.2
Rent	427.49	1,489.78	372.0
Total	$492,954.86	$158,977.66	32.2

The data in Tables IV, V and VI show the real cost facts of running a motor house specializing on factory work. Some conclusions are:

(A) That it costs less to handle wiring business than it does sales of motors, control, lamps, portable electric tools, repair parts, supplies, etc., which may explain, in large part, why many dealers have closed up their stores and shops and concentrated on contracting, doing business from a small, inconspicuous place.

(B) Any one familiar with the cost of doing business will agree that our general overhead is not unreasonable nor inconsistent with the operations of a modern institution, according to present-day standards.

In the ELECTRICAL WORLD for June 14, 1930, under the title "A Word for the Jobber," John J. Gibson, vice-president of the Westinghouse Electric Supply Company, gives recognition to the fact that the dealer branch of the electrical industry, in general, has an overhead of 30 per cent of the sale price.

(C) A comparison of Tables I, II and III, and IV, V and VI emphasizes that the total amount of overhead charged to the sales department, as compared to the amount charged to the wiring department and shop, is quite reasonable when one considers the number of transactions handled by the sales department as compared with either of the other departments.

small, is an individual one. Experienced merchants know that items of small dollar value, that have a turnover of less than one per year, cannot be handled on the above basis. If it were possible for us to allocate the actual overhead applicable to the repair part business, we have every reason to believe it would be considerably above the average for the sales department and that the net profit of 14.2 per cent would disappear.

Table VII—Net Profits 1929

Net Sales	Cost	Gross Profit	Per Cent Gross Profit of Sales	Overhead	Net Profit or Loss	Per Cent Net Profit of Sales	Per Cent Net Profit of Total Profit
			All Departments				
$403,194.30	$290,578.41	$112,615.89	28.0	$82,221.69	$30,394.20	7.53(a)	100
			Departmental Segregation				
			Wiring Department				
$170,713.13	$137,839.12	$52,874.01	27.7	$29,212.72	$23,661.29	12.43(b)	78
			Shop				
$64,243.78	$37,434.10	$26,809.68	41.5	$21,146.62	$5,663.06	8.82(c)	18.6
			Sales				
			(In the red 7 months out of 12)				
$145,392.18	$115,104.83	$30,287.35	20.8	$31,157.85	—870.50	....	—3.0
			Rental				
$2,845.21	$200.36	$2,644.85	93.0	$704.50	$1,940.35	68.2(e)	6.4

Table VIII—Net Profits for 1930

Net Sales	Cost	Gross Profit	Per Cent Gross Profit of Sales	Overhead	Net Profit or Loss	Per Cent Net Profit of Sales	Per Cent Net Profit of Total Profit
$291,889.10	$202,376.45	$89,712.65	30.7	$76,755.97	.....	....	....
	Accounts written off and commissions paid			$ 1,022.09	.....	....	....
				$77,778.06	$11,734.59		
					7,521.89	Other income	
					$19,256.48	6.6	100
			Departmental Segregation				
			Wiring Department				
$129,616.13	$91,074.61	$38,541.52	29.7	$26,235.33			
	Accounts written off and commissions paid			442.39			
				$26,677.72	$11,863.80		
					3,008.75	40 per cent of other income	
					$14,872.55	11.5	77.3
			Shop				
$58,149.06	$35,790.88	$22,358.18	38.5	$19,441.88	$2,763.61		
	Accounts written off and commissions paid			152.69	752.19	10 per cent of other income	
				$19,594.57	$3,515.80	6.05	18.2
			Sales				
$101,829.35	$75,283.83	$26,545.52	26.1	$30,288.17			
	Accounts written off and commissions paid			355.48			
				$30,643.65	—$4,098.13		
					3,760.95	50 per cent of other income	
					—$337.18		—1.7
			Rental				
$2,294.56	$227.13	$2,067.43	90.2	$790.59			
	Accounts written off and commissions paid			71.53			
				$862.12	$1,205.31	52.5	6.2

The data in Tables VII and VIII give evidence of our net profits in two years. The conclusions are:

(A) That our net profit on the entire volume of business is small.

(B) That the wiring department is providing the major profits and, therefore, is carrying the load of the sales department.

(C) That the net profit of the repair shop is small. If we are to continue to render that broad service apparently expected of us we cannot maintain even this rate of profit if the manufacturers aggressively compete for this class of business.

(D) That the sales department is a dead loss and, therefore, not on a "sound economic basis," and that it needs the attention of the manufacturers, wholesalers and dealers if it is to function.

It is interesting to know, also, that the sales department would be further in the red were it not for the second-hand business, which bolsters up the situation with higher mark-ups than is applicable to new equipment.

To this extent, therefore, the manufacturers should not be so jealous of the sales we make of second-hand equipment, nor should they overlook the fact that we are continually facilitating the sale of new equipment by taking in exchange second-hand apparatus.

(E) That the rental business is very profitable, but, unfortunately, this is small and declining, due to the continued reduction in sale prices of new equipment, and to this extent our profitable fields of operation are being narrowed.

I am sure I do not have to argue with any executive of the manufacturers that it is impossible to continue to carry in stock the hundreds of items we have on hand on any such marginal basis. The needlessness of asking us to operate this way is illustrated by the following, which is the way we actually sell:

List price		$6.00	
Selling price		6.00	
Cost	$2.70		
Gross mark-up		$3.30, or 122 per cent of cost	
Overhead 27.1 per cent of cost	0.73		
Gross cost		$3.43	
Net profit		$2.57	or 43 per cent of selling price

Since we can sell this way in 99 per cent of the cases without complaint, there cannot be anything very wrong with the price. We find our customers more interested in the expense of lost production and idle workmen than the price of the repair part and the cost of installing. They are willing to pay for the service and happy to find we have the part they want when they want it.

If it is just for the manufacturer to complain of the dealer having sold motors at cut prices, I think the dealer can now as justly complain of the manufacturer selling repair parts on a cut price basis. Furthermore, the motor policy lays down the principle that the dealers are supposed to care for the class A business and sell motors and control at book prices. Consistency, as well as the foregoing, demands that repair parts be handled likewise.

Does it not seem unfair to undermine the dealer, as is done, on a line where he has to carry such a wide variety of stock, thus performing a valuable service to industry?

We know, of course, that the manufacturers have complained that their repair part business is not increasing as they feel it should, and the cause for this is laid to the competition of small manufacturers of parts. Has it ever occurred to the manufacturers that this may be the result of the workings of economics, that dealers like ourselves have been stimulated to go into the manufacture of parts because you do not afford them an adequate return? Is it not a fact, also, that cutting the price to class A customers has not resulted in stimulating sales?

The manufacturer's disappointment in the response of the dealer to the margin offered a couple of years ago was quite natural, but, on the other hand, neither the dealer nor the manufacturer's sales organization was mentally prepared for this. The scheme was not kept in vogue long enough and no well-organized campaign was put on to give the plan a real try-out.

How transformers are sold

The following is an outline of how manufacturers ask us to sell transformers:

		2—10 kva.	2—7½ kva.
Selling price		$487.44	
Cost	$440.94		
Gross mark-up		$46.50, or 10.35 per cent of cost	
Overhead 27.1 per cent of cost	121.80		
Gross cost		$562.74	
Loss		$75.30	

Is it fair to ask the dealer to sell transformers at a loss, when it is so well known that this is one of the manufacturers' most profitable lines? I could enumerate many other things, such as oil switches, meters and instruments, industrial heating, welding equipment—apparatus on which manufacturers make a profit, but where you do not provide any for the dealer.

The dealers understand that transformers and oil switches are items which are usually sold direct, or through other channels. We do not dispute the logic of the manufacturer selling as he does to class B and other large buyers, but feel he could establish a class A discount which would provide the dealer a profit. If, however, he elects to maintain the present arrangement, the manufacturer should not feel offended if the dealer seeks other sources of supply.

Overhead offset by competition costs

I would remind those who may criticise the overhead charged against the illustrations of lamps, motors and transformer sales that 50 per cent of the business of our sales department is done in these unprofitable products, and that while we may get a quick turnover on certain of these items, with little or no investment, this is largely offset by the added effort to consummate the sale because of highly competitive conditions. The appeal made by manufacturers for our interest in these products seems worthy of being supported by margins to make it possible for us to respond to their desire. If, however, in due course, they do not improve the situation, the workings of economics will result in their lines being slighted by the dealer seeking, and devoting his attention to the sale of, specialties that will pay their own way.

Other marketing policies discussed

The facts which I have already presented show how we have deviated from sound economics, and to this might be added the following:

The manufacturer's policy on motors provides that the dealer is to take care of class A customers. On the other hand, the wholesalers have no actual classification of trade that is similar to this. Certainly there should be a better degree of co-ordination. One could hardly expect the dealers to handle the sale of part of a manufacturer's products under one arrangement of trade classification and other products of the same manufacturer under another arrangement. Furthermore, the manufacturer himself, after expecting us to maintain a repair shop and stock a wide assortment of repair parts, offers class A customers 33⅓ per cent discount on repair parts when purchased direct, which is hardly consistent with the desire to have us sell motors to class A customers at book prices.

That we are rendering a real service, in a broad sense, is illustrated by the fact that in 1929 we had on our books 929 accounts, 400 of which did business with us at least ten months of the year. In the two counties which we serve we therefore probably have on our books about as many accounts as all of the electrical manufacturers represented in the bay area combined have on their books. This is a significant and important situation to contemplate.

No doubt there are dealers in San Francisco who can point to an equal broadening of the manufacturer's contacts through the services they render. If this is true, it therefore follows that we are relieving the manufacturers and wholesalers of a considerable sales expense for the volume of business we produce in our mutual interests in connection with class A trade.

The theory of the motor policy presupposes that we

Table IX—Analysis of Wiring Jobs, 1929

1-A 35 Jobs—$1 to $50

Selling price		$1,006.29	
Cost	$649.31		
Gross mark-up			$356.98, or 55 per cent of cost (A)
Overhead 21.2 per cent of cost	137.50		
Gross cost		$786.81	
Net profit		$219.48	or 21.9 per cent of selling price
Average net profit per job			$6.38

2-A 35 Jobs—$50 to $100

Selling price		$2,516.09	
Cost	$1,631.03		
Gross mark-up			$885.06, or 54.3 per cent of cost (A)
Overhead 21.2 per cent of cost	358.00		
Gross cost		$1,989.03	
Net profit		$527.06	or 20.9 per cent of selling price
Average net profit per job			$15.05

3-A 35 Jobs—$100 to $250

Selling price		$5,881.22	
Cost	$3,834.48		
Gross mark-up			$2,046.74, or 53.5 per cent of cost (A)
Overhead 21.2 per cent of cost	813.00		
Gross cost		$4,647.48	
Net profit		$1,233.74	or 21.0 per cent of selling price
Average net profit per job			$35.30

4-A 20 Jobs—$250 to $1,000

Selling price		$9,977.95	
Cost	$6,673.72		
Gross mark-up			$3,304.23, or 49.5 per cent of cost (A)
Overhead 21.2 per cent of cost	1,413.00		
Gross cost		$8,086.72	
Net profit		$1,891.23	or 19 per cent of selling price
Average net profit per job			$94.60

5-A 12 Jobs—$1,000 to $2,000

Selling price		$15,757.95	
Cost	$11,204.78		
Gross mark-up			$4,533.17, or 40.6 per cent of cost (A)
Overhead 21.2 per cent of cost	2,375.00		
Gross cost		$13,579.78	
Net profit		$2,178.17	
Average net profit per job			$176.00

6-A 10 Jobs—Over $2,000

Selling price		$36,404.41	
Cost	$26,401.79		
Gross mark-up			$10,002.62, or 38 per cent of cost (A)
Overhead 21.2 per cent of cost	5,600.00		
Gross cost		$32,001.79	
Net profit		$4,402.62	or 12.1 per cent of selling price
Average net profit per job			$440.25

Table X—Analysis of Shop Jobs, 1929

1-B 35 Jobs up to $5

Selling price		$125.50	
Cost	$65.47		
Gross mark-up			$60.03, or 92.3 per cent of cost (B)
Overhead 56.5 per cent of cost	37.00		
Gross cost		$102.47	
Net profit		23.03	or 18.4 per cent of selling price
Average net profit per job			$0.66

2-B 35 Jobs—$5 to $10

Selling price		$261.82	
Cost	$136.25		
Gross mark-up			$125.57, or 92.2 per cent of cost (B)
Overhead 56.5 per cent of cost	77.00		
Gross cost		$213.25	
Net profit		$48.57	or 18.6 per cent of selling price
Average net profit per job			$1.39

3-B 35 Jobs—$10.00 to $25.00

Selling price		$584.09	
Cost	$322.89		
Gross mark-up			$261.20, or 81 per cent of cost (B)
Overhead 56.5 per cent of cost	182.50		
Gross cost		$505.39	
Net profit		78.70	or 13.5 per cent of selling price
Average net profit per job			$2.25

4-B 35 Jobs—$25 to $50

Selling price		$1,237.23	
Cost	$674.85		
Gross mark-up			$562.38, or 83.6 per cent of cost (B)
Overhead 56.5 per cent of cost	381.00		
Gross cost		$1,055.85	
Net profit		$181.38	or 14.7 per cent of selling price
Average net profit per job			$5.18

5-B 35 Jobs—$50 to $100

Selling price		$2,399.55	
Cost	$1,256.05		
Gross mark-up			$1,143.50. or 91.3 per cent of cost (B)
Overhead 56.5 per cent of cost	714.00		
Gross cost		$1,970.05	
Net profits		$429.50	or 17 9 per cent of selling price
Average net profit per job			(12.25

6-B 35 Jobs—Over $100

Selling price		$6,639.05	
Cost	$3,895.70		
Gross mark-up			$2,743.35, or 70.6 per cent of cost (B)
Overhead 56.5 per cent of cost	2,200.00		
Gross cost		$6,095.70	
Net profit		$543.35	or 8.2 per cent of selling price
Average net profit per job			$15.50

are to leave the class B customers alone and that the manufacturer will handle them direct. This might be all right if the manufacturer handled them direct on everything, but it is neither practical nor possible for him to do this in connection with wiring supplies. It may surprise you to know that in 1929 we did more than $73,000 worth of business with 44 class B customers. This is 18 per cent of our volume, and neither the wholesaler nor the manufacturer can ignore the importance of such clients.

Let us take the account of a large national manufacturer, with a sizable branch in our territory, with whom we did $9,600 worth of business, practically all of which was handled by our sales department. The gross mark-up was only 12.3 per cent because we have to give him a discount on almost everything we sell him. The business, of course, was handled at a loss.

There were some twenty-one transactions over $100, with a total volume of $5,300, which was principally made up of the sale of new motors and control. There were 215 transactions of less than $100, with an aggregate volume of $4,300, or an average of $20 each. The small transactions consisted mostly of repair parts and supplies.

Now why does this industrial customer come to us rather than deal with the electrical manufacturer? It is because we have a wide assortment of stock, because he can get most of the things he wants with one call, because we have the advantage of being located in the immediate vicinity and we can serve him promptly and

Table XI—Analysis of Sales Tags, 1929

1-C 73 Tags less than $2.50

Selling price		$107.48	
Cost	$70.20		
Gross mark-up			$37.28, or 53 per cent of cost (C)
Overhead 27.1 per cent of cost	19.05		
Gross cost		$89.25	
Net profit		$18.23	or 17 per cent of selling price
Average net profit per tag			$0.25

2-C 73 Tags—$2.50 to $7.50

Selling price		$354.68	
Cost	$250.87		
Gross mark-up			$103.81, or 41.4 per cent of cost (C)
Overhead 27.1 per cent of cost	70.10		
Gross cost		$320.97	
Net profit		$33.71	or 9.5 per cent of selling price
Average net profit per tag			$0.46

3-C 74 Tags—$7.50 to $25.00

Selling price		$1,190.52	
Cost	$908.49		
Gross mark-up			$282.03, or 41.1 per cent of cost (C)
Overhead 27.1 per cent of cost	246.00		
Gross cost		$1,154.49	
Net profit		$36.03	or 3.03 per cent of selling price
Average net profit per tag			$0.49

4-C 74 Tags—$25 to $75

Selling price		$3,404.22	
Cost	$2,718.90		
Gross mark-up			$685.32, or 25.3 per cent of cost (C)
Overhead 27.1 per cent of cost	736.00		
Gross cost		$3,454.90	
Net profit or loss		$—50.68	
Average loss per tag			$0.68

5-C 52 Tags—$75 to $150

Selling price		$5,303.38	
Cost	$4,275.26		
Gross mark-up			$1,028.12, or 24 per cent of cost (C)
Overhead 27.1 per cent of cost	1,158.00		
Gross cost		$5,433.26	
Net profit or loss		$—129.88	
Average loss per tag			$2.50

6-C 29 Tags—$150 to $250

Selling price		$5,561.92	
Cost	$4,580.86		
Gross mark-up			$981.16, or 21.4 per cent of cost (C)
Overhead 27.1 per cent of cost	1,304.00		
Gross cost		$5,884.86	
Net profit or loss		$—322.94	
Average loss per tag			$11.10

7-C 24 Tags—Over $250

Selling price		$11,247.14	
Cost	$9,096.12		
Gross mark-up			$2,161.02, or 23 per cent of cost (C)
Overhead 27.1 per cent of cost	2,460.00		
Gross cost		$11,546.12	
Net profit or loss		$—298.98	
Average loss per tag			$12.50

The data in Tables IX, X and XI give an analysis of some nineteen groups of transactions. This shows that:

(A) That we get a satisfactory mark-up on wiring jobs of all sizes, and therefore, as a business proposition, we should devote our major attention to this phase of our operations.

(B) That it requires a high mark-up to handle successfully shop work; that trouble calls which involve jobs from $10 to $50 depreciate the profits to be made, and that repair jobs which run over $100 are not handled at a satisfactory mark-up and profit, due to the fact that most of this group are straight rewinds.

The reason we are limited in the profit of rewinds is due to the fact that, in general, rewinding of induction motors is based upon a definite scale of prices, computed as a percentage of the new motor price. New motor prices have been coming down as a result of quantity production methods, but the repair shops have not been able to effect any such economies in their work, as every job is different, and, to a very large extent, involves skilled hand labor.

It is interesting to observe that in some sections of the country the manufacturers are cutting rewind prices as much as 10 per cent, and want the level permanently reduced. They want the business for their own shops and are jealous of what we enjoy, yet, on the other hand, they do not want to be bothered themselves with miscellaneous small trouble calls and the many little things it is necessary for us to handle in behalf of the industry.

(C) That we do not make a satisfactory mark-up and net profit on any size of sales tag, and actually lose money on most. Sales $25 and over involve a good many motors, control and lamps, and, due to the low mark-up on these, we lose money, and the larger the tag the more we lose.

Under the circumstances, as a business proposition, the manufacturers are expecting too much when they ask us to give major attention to motors, control, and lamps, and that the theory of large profits for us in handling a large volume of small customers is an error.

intelligently and have an intimate understanding of his requirements.

In spite of the fact that the manufacturer's policy makes it mandatory to handle this business without profit, we would be derelict in our duty as a representative of the electrical industry if we did not serve these customers creditably. Is it not true that, if we are to conduct our business on sound economic principles, this problem must also be given consideration?

In 1929 there were a half dozen class B customers with whom we did over $10,000 each, having to do with plant extension and remodeling, or modernization of power and lighting systems. Our margins on this are reduced by the policy, or lack of policy, on the part of the wholesalers. Even industrials who maintain their own electrical department lean on the electrical dealers for much of their major electrical work and, therefore, regardless of the aspirations of the manufacturers and wholesalers to deal with these people direct, we cannot avoid contact with them. If we serve them well in regard to some things, it follows that they are likely to get into the habit of leaning on us for other things.

I have repeatedly heard it said among the councils of the manufacturers that the biggest single element in commercial affairs is the personal relation between seller and buyer. The manufacturers should not overlook the fact that we have our personal friends, and they are much more inclined to do business with us than with the manufacturer.

In this connection I do not have in mind the very large industrials, such as the steel plants, cement plants, railroads, etc., where the manufacturer has the better opportunity to develop personal friendships, as well as to serve to better advantage, but I do have in mind many of the moderate size class B customers, and some of those who have branch plants scattered over the United States.

Discrimination in discounts

Another inconsistency has to do with the policy to accord machinery manufacturers and manufacturers' agents more discount than you accord your dealers, of whom you expect and demand undivided support. The machinery manufacturer or manufacturers' agent does not exploit one line to the exclusion of others, nor does he major in electrical equipment, and he is not interested in building up the electrical industry. Does this not seem unfair as well as unbusinesslike?

The electrical sales made by the machinery manufacturer are carried along with his equipment, but we are expected to handle the numerous small, individual sales which are competitive and relatively expensive to make.

Admitting all the weaknesses of the motor dealers as a class, there is some reason to believe that the manufacturer has contributed to much of this by the establishment of, literally, hundreds of motor dealers. The dealers, as a group, are very largely judged by the weaknesses of the hundreds of dealers that thoughtless commercial men have established just to get an order.

If the manufacturer would make the situation sound for those who really qualify they would, in due time, be better producers. In the long run the manufacturer would gain more than he would lose by dropping the unqualified ones.

The practices employed by the larger manufacturers to corral every available outlet for motors and the establishment of repair shops of their own have made it very difficult for the small manufacturers of motors to compete. These are strong instruments, and when they are linked together with the activities of the large manufacturers' incandescent lamp and supply organizations, an almost impossible situation is produced. The result is that the small manufacturers stoop to the use of expedients to secure business which aggravate the large ones and bring upon their shoulders the criticism that they are contributing to the breaking down of our industry.

If we are to have stability, then each manufacturer must be willing to accord some rights to others, and each should be discriminating and cautious in what he does. Is it not a fact that there is a great tendency to do the "super" job, or, in other words, the impossible? We all have limitations, and it is not an admission of defeat to recognize them and be more sane, sensible and moderate in our accomplishments. We can each succeed and retain our place of leadership more soundly this way than through extremes, a fact which is being impressed upon all of us in this year of 1930.

Dealer senses his responsibility

Many, no doubt, will say that all of these ideas sound fine, but the dealers have failed repeatedly for years. Such a point of view is not without some merit, but, on the other hand, among the dealers, as among the manufacturers, you will find a handful who have succeeded in spite of the conditions under which they have had to operate and, to that extent, have shown good business ability and leadership.

Times are changing continually. The dealers are thinking and doing differently today than in the past. We recognize, as never before, that we have a responsibility to do a good job in behalf of the industry, as well as ourselves, and that we have to run our business efficiently, as well as profitably. We understand that we ask either the balance of our industry or our clients to tolerate, as well as pay the price of, our inefficiencies.

I am sure all will agree that the improvement which the dealers would like to see are as much to the interest of the manufacturers and wholesalers as to the dealer if the latter is to carry on his activities with the enthusiasm and completeness which the manufacturers are continually urging upon him.

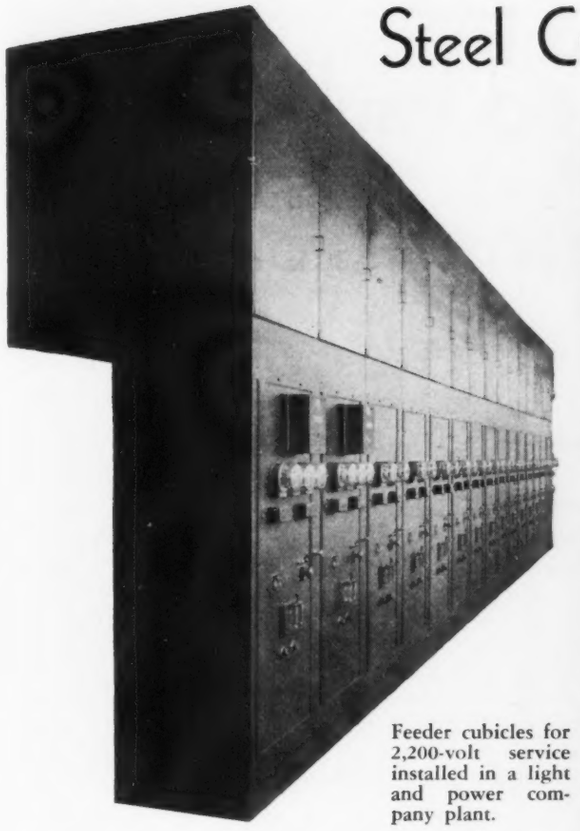
Offer business as a laboratory

It would seem that the foregoing thoughts and facts raise, in a very serious way, the question as to whether or not the manufacturers and wholesalers really want organizations like ours to represent them, develop the sale of their products and be the industry's source of contact with a large part of the public. In due course of time the real answer to this question will be evidenced in a concrete way.

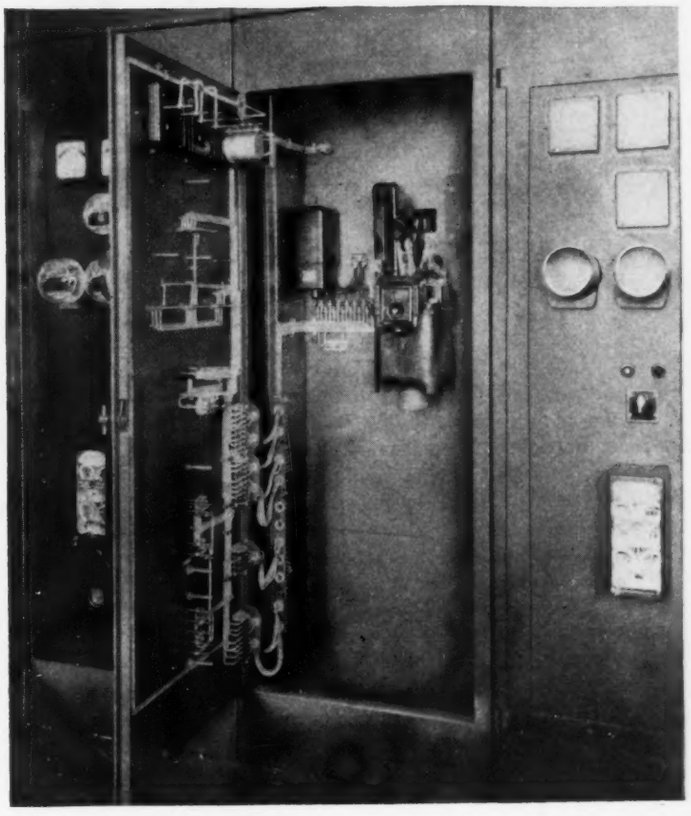
If our point of view and data demand further investigation and information we are glad, in conclusion, to afford our friends full opportunity to study and investigate our methods of operation, accounting, etc.

If our organization can prove to be a sort of business laboratory, we are willing, in the interest of doing something constructive for the industry, to assist in gathering as much information as may be needed.

Steel Cubicles Widely Used



Feeder cubicles for 2,200-volt service installed in a light and power company plant.

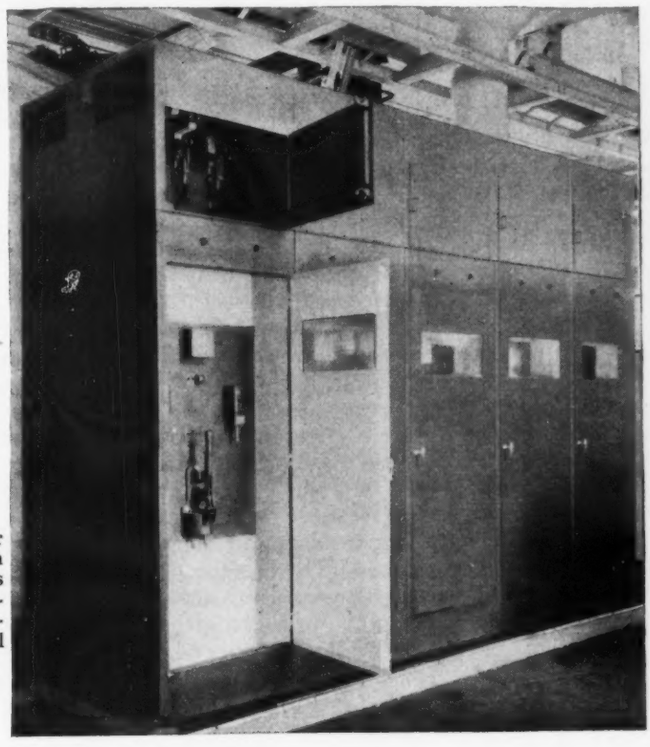


Cubicles for synchronous motor starting in a steel mill.

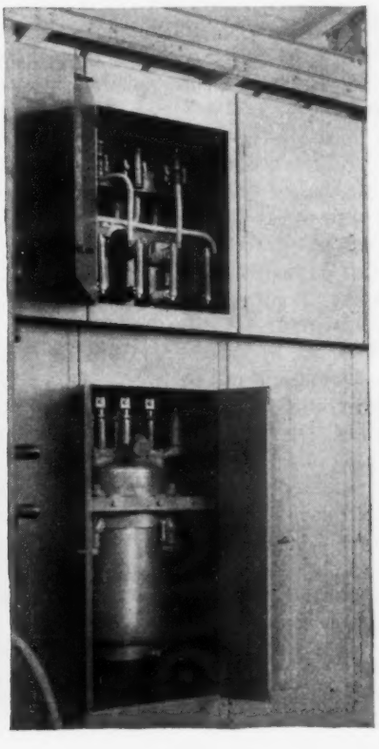
Indoor steel cubicles are used for indoor service at from 2,300 to 15,000 volts. This type of equipment is about two years old and has undergone modification and simplification that increases safety and gives a wider range of application.

Open compartment of steel mill cubicle for synchronous motor starting.

Photos Courtesy General Electric Company



Feeder cubicles for 440-volt service in a hospital. Lamps above doors indicate breaker position. Stainless steel door handles.



Performance of Wood Insulation in Transmission Lines*

By F. E. ANDREWS
Public Service Company of Northern Illinois, Chicago, Ill.

NO INTERRUPTIONS due to lightning flashover as indicated by line trip-outs and no cases of 60-cycle power arcs following lightning flashovers are recorded for 1930 on 90 miles of all-wood constructed 33-kv. lines on the Public Service Company of Northern Illinois' system. This performance compares with respective figures of 42 and 30 for the same items per 100 miles of line on 1,025 miles of previous construction.

Evidence of lightning strokes, as shown by splinters on poles, arms or guy insulators, was found on about 100 of the new type structures. Careful inspection at each of these locations showed that there had been no power follow-up and consequently no line interruption, proving that the new construction was functioning as designed. It is interesting to note, however, that the three cases of serious pole and arm damage due to splintering by lightning that occurred on the 90 miles of new construction corresponds proportionately to the 33 that occurred on the little more than 1,000 miles of the older type.

The former standard type of construction on the 33-kv. system followed conventional designs, using a 10-ft. wood crossarm with two conductors supported on one side of the pole and one conductor on the other. The arm was held by a 5-ft. steel angle-iron span brace. Except in isolated cases no overhead ground wire was in use.

In spite of the fact that the best known practice was being followed in the construction of these lines, including the use of both better and higher voltage insulators, efforts to improve lightning performance appeared to be ineffectual. Careful inspection of a large number of cases of damage caused by power arcs following lightning flashovers resulted in the following conclusions:

On structures not guyed or grounded flashovers are due to phase-to-phase arcs utilizing the steel brace as part of the short-circuit path.

On grounded structures flashovers occur from phase to ground. On guyed structures flashovers occur from phase to phase or from phase to brace to guy to ground.

The remedy appeared quite obvious. It consisted of the elimination of the metal-conducting path between conductor supports, increasing the spacing between conductors so that power arcs would not form between phases, elimination of hardware grounding and the use of insulation in the guys of such value that the 60-cycle arcs would not go across. Wood crossarm braces were substituted for the steel braces and a triangular conductor configuration, with one conductor supported on a ridge fixture at the top of the pole about 5 ft. above the crossarm, was adopted. This arrangement provided 9 ft. of wood between each pair of conductor supports. On existing lines where there was not sufficient space on the pole to permit lowering the crossarm there was adopted another configuration in which one conductor was mounted on the top of the pole and the crossarm was left in its original position. This expedient provided about 4 ft. of wood between conductor supports.

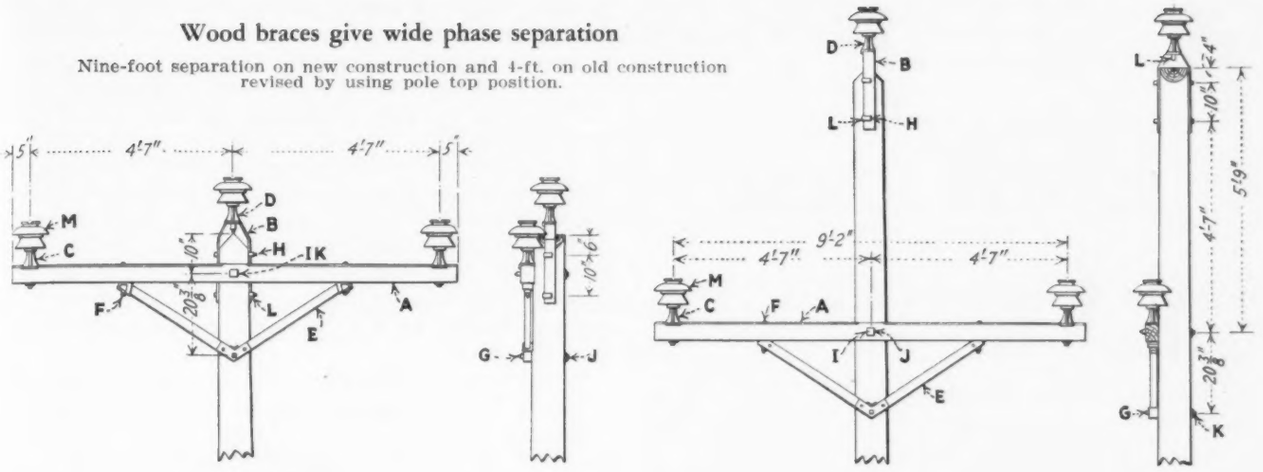
For insulation of the guys a wood strain insulator was selected. The original design of wood insulator using a wedge type of construction and without arcing horns did not prove to be satisfactory, so a different design with steel fittings at each end, simply attached to the wood by bolts, was devised. Arcing horns are now being used on these insulators. In some instances porcelain-strain type

All-wood pole top
Double-circuit line with wood braces and wood strain insulators in guys

*Abstract of paper presented at recent meeting of Engineering Section, Great Lakes Division, N.E.L.A.

Wood braces give wide phase separation

Nine-foot separation on new construction and 4-ft. on old construction revised by using pole top position.



insulators were used in the guys. The arcing horns were adopted after it had been proved that the expectation that some of these insulators would be shattered by lightning was correct.

The dimensions adopted with respect to the amount of wood between conductor supports and wood insulation between conductor supports and grounds are to a certain extent empirical, as data are not available from which the dimensions required to prevent follow-up power arcs can be definitely determined. Originally the amount of insulation to ground was determined principally on the basis of estimates of probable lightning voltages on the line, and we believe this insulation to be such that the lightning flashover will not occur, except from the more severe lightning discharges.

There is great need for additional research to determine the dimensions which should be used with so-called all-wood construction for the different power system voltages in order to prevent power arc flashover. There is also need for research to determine the action and spacing of arcing horns with respect to power arcs, because of the fact that experience shows that horns are

Analysis of Path of Flashover on Inspected Wood Structures Where Flashovers Occurred

Type of Structure	Phase-to-Phase Burns Only in Per Cent of Total Flashovers Inspected	Phase-to-Ground or Phase-to-Guy Burns in Per Cent of Total Flashovers Inspected	Lightning Sparkover Value in Volts One Conductor to Ground
No guys or grounds, wood or steel arm, steel brace	40	0	3,000,000 minimum
Guyed or grounded, steel brace, wood arms	4	41	250,000 minimum
Guyed, not grounded, steel arm.	9	6	500,000 to 800,000
Total	53	47	

Lightning Performance of Lines— 33 Kv.

Operation Data	*Type A and Others 1929	*Type A and Others †1930	*Type C †1930
Miles of line	1,045	1,025	90
Flashovers due to lightning per 100 miles of line, as indicated by trip-outs	45	42	0
Number of cases of 60-cycle flashovers due to lightning per 100 miles of line as indicated by patrol or line repair	36	30	0
Serious pole and arm damage due to splintering by lightning	No data	33	3
Trip-outs directly due to lightning flashovers in per cent of total trip-outs	35.7	36.8	0

*Type A—Old construction. Type C—New construction. †First nine months of year.

Summary of Lightning Flashover and Insulator Performance, 1929

The significant points shown by this operating record are:

There was one trip-out directly due to lightning for about each 2 miles of 33-kv. line. The 1930 record was approximately the same.

About 80 per cent of the flashovers were located by patrolling, as indicated by insulator replacement and repair records.

The flashovers were well distributed over the different types of structures, about 42 per cent being on structures without guys or grounds.

Pole-top switches are especially susceptible to flashovers, these being installed with steel connections between the supporting channels of different phases and having grounded bases.

Fifty-eight per cent of all line interruptions were due to lightning.

	132 Kv.	33 Kv.	12 Kv.
Mileage			
Wood pole construction	0	1,045	130
Steel tower construction	297	25	10
Operating Record			
Line trip-outs directly due to lightning per 100 miles	1	45	15
Line trip-outs indirectly due to lightning per 100 miles	.....	26.5	12
Total cases of insulator flashover located per 100 miles	1	36	28
Cases of insulator flashover located on lines with overhead ground wire per 100 miles of this type of line	1	20	.....
Cases of insulator flashover located on grounded structures per 100 miles	.....	11.5	6.9
Cases of insulator flashover located on structures with guys but no grounds per 100 miles	.....	9.5	7.1
Cases of insulator flashover located on structures not guyed or grounded per 100 miles	.....	15	14
Cases of insulator flashover located on pole-top switches per 100 switches	.....	11	3.3
Cases of insulator flashover located on steel towers per 100 towers	.....	7	4.2
Number of insulators changed due to electrical damage per 100 miles	5.15	75	58.5
Number of insulators changed due to external breakage per 100 miles	8.1	139	204

necessary to prevent shattering of the guy insulators. Further study of materials and designs for guy strain insulators also appear to be needed.

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READERS' FORUM

Reversed Refrigerating Cycle for House Heating

To the Editor of the ELECTRICAL WORLD:

As you are aware your abstract of my paper "Reversed Refrigerating Cycle for House Heating" (August 16, 1930, ELECTRICAL WORLD) is fairly general and not intended to be a detailed analysis of the economics of this particular system of heating.

It has not been possible for me to pursue the subject very much further except in regard to the heating of swimming baths, which, as mentioned in the paper, probably represents the most favorable circumstance for the use of the reversed cycle heat engine. This application of the reversed cycle heat engine is being developed by a well-known firm of refrigerating engineers in this country, L. Sterne & Company, Ltd., and it is to be hoped that it will be possible to apply the system before long. I have recently read two further papers about the reversed cycle heat engine, one at the Institution of Heating and Ventilating Engineers and one at the British Association of Refrigeration on November 5 and 6, respectively.

Economical application of the reversed-cycle heat engine to the heating of an average size house, assuming various temperature limits, depends largely on the cost and efficiency of the apparatus which the manufacturers of refrigerating plant could put forward for this purpose. At the present time the capital cost of a small refrigerating plant, at any rate in this country, is so high as to place serious difficulties in the way of utilizing the heat pump for the heating of average size houses. For instance, the 5-kw. experimental plant which I used in my own home cost about £350, although, naturally, some of this expenditure was on account of special experimental apparatus. I see no reason why the makers of refrigerating plants should not put forward suitable apparatus at a much lower price, if they were convinced that a large demand could be developed.

One of the most important factors in the economical use of the reversed-cycle heat engine is that there should be available a large supply of water from which heat is extracted in the evaporator. This, unfortunately, is not always available, and the alternative of using an air evaporator has not yet been properly developed. I am afraid there would certainly be difficulty in using an air evaporator at the low temperatures in your northern states. However, there is an alternative to which I have already called attention, and that is to use water for the evaporator, but to freeze this water, thus getting the advantage of the latent heat and very considerably reducing the quantity of water required. The difficulty with this latter method is to get rid of the ice which would be formed. On the other hand, the ice might have a certain commercial value even during parts of the winter. I have suggested to the refrigerator makers in this country that some development of the original Holden process is desirable. I would refer you in this connection to an article in the *Refrigerating World* of July, 1930, dealing with the production of "Flakice," written by Crosby Field.

You will note that if the process mentioned above could be adapted to the requirements of the reversed-cycle heat engine it would be possible to work at a moderate evaporation temperature, and therefore to get a considerably higher efficiency than would be possible with an air-exposed evaporator, which on occasions might, in your country, have to be at a temperature considerably below zero Fahrenheit.

The evaporator difficulties referred to above would, of course, to a considerable extent be overcome if it were found possible to develop a centralized system on a comparatively large scale, in which the centralized plant would be used to distribute to a considerable number of consumers:

(a) A supply of hot water for heating purposes, either to a number of domestic or office consumers or for a swimming bath.

(b) A supply of cold brine for refrigerating or cooling purposes, or for an ice rink.

With such a scheme the brine would play the part of a continuous supply of water to the evaporator referred to above, and it may be of interest to note that a large scheme of this kind is at present being considered in France.

I hope you will be able to get some of the refrigerator makers on your side of the Atlantic interested in the proposition, and naturally I shall be interested to hear of any developments that may occur. I only regret that I have not time at present to pursue the matter in detail.

32 Victoria St.
Westminster, London.

T. G. N. HALDANE.

Ingenuity Will Solve the Industry's Problem

The problem in front of us is to get over to those whom we are serving a realization of the fact that the issue before them is the choice of one of two things: Either the preservation of commercial ownership of industry—not only the electric light and power industry, and the gas industry, the telephone industry, but all industries—or the socialization of industry.

I say if we bring the same intelligence and the same foresight and the same ingenuity to bear on this problem of informing the public so that they may be truly sympathetic with our problems, I say if we bring the same ingenuity to bear on that as we have brought to bear on solving the technical, the physical problems that have confronted us in all of the various branches of the utility business, we will do it!

J. F. OWENS,
Vice-President, General Manager
Oklahoma Gas & Electric Company.
(Addressing the Oklahoma Utilities Association)

Men of the Industry

Harry T. Edgar Retires from Stone & Webster Activities

HARRY T. EDGAR, for the past 32 years associated with Stone & Webster in managerial work in various parts of the country, has resigned from that organization. Mr. Edgar entered the public utility field in 1886 as an employee of the Edison Electric Illuminating Company of New Brunswick, N. J., soon going to New York with the engineer-

ing department of the Edison Electric Light Company, a predecessor of the General Electric Company. After seven years of construction work he became secretary and general manager of the Georgia Electric Light Company, Atlanta. In 1897 he entered the sales field and spent two years in the electrical apparatus market in New York and New England. Since 1899, when he joined the Stone & Webster organization, Mr. Edgar has served as manager of the Lowell Electric Light Corporation, El Paso Electric Company, Northern Texas Traction Company of Fort Worth and Seattle Electric Company, including both power and railway interests. Since 1912 he has made his headquarters at Boston, serving as district and division manager of the Middle West district, and operating railway and power properties centering at Houghton, Mich.; Paducah, Ky.; Keokuk, Fort Madison and Dallas, Iowa.

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FRANK C. REED, general sales manager of the Westinghouse Electric Elevator Company, was elected vice-president at a recent meeting of the board of directors in place of R. I. Phillips, resigned. Mr. Reed has been associated with the Westinghouse organization since 1903.

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Niagara Hudson Adds Three Assistant Vice-Presidents

AT A MEETING of the board of directors of the Niagara Hudson Power Corporation held April 15 in New York City three new officers were elected. W. L. COLLINS, vice-president of the Buffalo, Niagara & Eastern Power Corporation; M. E. SKINNER, vice-president of New York Power & Light Corporation, and C. A. TATTERSALL, vice-president of Buffalo, Niagara & Eastern Power Corporation, were elected assistant vice-presidents of Niagara Hudson Power Corporation. JOHN F. LYNCH, treasurer of Buffalo, Niagara & Eastern, was elected assistant comptroller.

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J. W. YOUNG, electrical engineer of the Narragansett Electric Company, Providence, R. I., has been transferred to the Boston office of the New England Power Association, where he will serve as assistant distribution engineer under W. C. Phillips, who has charge of this work in the retail properties of the organization. Mr. Young was formerly electrical designing engineer with the Duquesne Light Company, Pittsburgh. He went to Providence about two and one-half years ago and has had an active part in the distribution system improvements since effected on this important subsidiary of the Power Association.

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R. C. COSGROVE has been appointed rural distribution manager of the merchandising department of the Westinghouse Electric & Manufacturing Company. Mr. Cosgrove was graduated from Carnegie Institute of Technology with a degree of B.S. in commercial engineering in 1918 and before his recent appointment was manager of the Westinghouse small-electric plant and water system sales. He is a member of the American Society of Agricultural Engineers, the National Committee on the Relation of Electricity to Agriculture, farm equipment committee of the National Electric Light Association and the water system committee of the National Association of Farm Equipment Manufacturers. The rural division will be responsible for the distribution of all the Westinghouse merchandising products in rural areas.

A. J. Goedjen Heads Wisconsin Association

A. J. GOEDJEN, division manager of the Wisconsin Public Service Corporation at Green Bay, has been elected president of the Wisconsin Utilities Association. Mr. Goedjen has had extensive training with the public utility companies in the Middle West. A graduate of the University of Wisconsin, he took the General Electric Company's test

course for two years, and then spent one year drafting and designing in the engineering department of the Commonwealth Edison Company. He served for several more years as superintendent of the meter and testing department and later as assistant in the electrical department of the Milwaukee Electric Railway & Light Company. He then became electrical engineer of the Merchants Heat & Light Company, Indianapolis, rebuilding all the electric lines and substations and the electrical equipment of the power plants of that company. He returned to Wisconsin in 1916 as assistant manager of the Wisconsin Public Service Corporation at Green Bay and then affiliated himself with the Menominee & Marinette Light & Traction Company in the capacity of manager for a period of six years; here also he played a prominent part in the rebuilding of the property, devoting his time and attention unstintingly to development work.

Mr. Goedjen has been active in the affairs of the Wisconsin Utilities Association, particularly those dealing with rural rates, inductive co-ordination and the Wisconsin State Electrical Code. He is a past-chairman of the electric section.

M. C. Smith Appointed Manager in El Paso

M. C. SMITH has been named manager of the El Paso Electric Company, succeeding Francis J. Gannon, who has been transferred to Tampa, Fla. Mr. Smith for the past six years has been president of the Baton Rouge Electric Company and was also president of the Louisiana Steam Products Company. He has been connected with companies under Stone & Webster executive management since 1912 and has had a wide experience both in the light and power and railway divisions of various companies in this group. Mr. Smith is a native of Maine and a graduate of the

University of Maine. His early connections included the Cape Breton Electric Company, the Brockton and Plymouth Street Railway Company and the Nova Scotia Tramways & Power Company.

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R. B. MCELROY, assistant sales manager, has been named merchandise sales manager of the Washington Water Power Company, Spokane, according to the announcement of J. E. E. Royer, general manager.

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D. B. PORTER of Fairmont, W. Va., commercial representative of the Clarksburg division of the Monongahela West Penn Public Service Company, has been named manager of the southern division of the company.

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CYRIL R. BROADHEAD has been appointed power sales manager of the Narragansett Electric Company, a leading subsidiary of the New England Power Association serving Providence, R. I., and vicinity. Mr. Broadhead is well known in New England utility circles. He is a native of Providence, and virtually his entire business career has been in the servce of the Narragansett company since his entry into the power sales department about twenty years ago. For some time he was closely associated with J. E. Gray in rate engineering work prior to Mr. Gray's transfer to Boston as rate engineer of the Power Association, and he has had a varied experience in industrial power and heating applications in the Rhode Island territory.

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OBITUARY

John R. Wilde

JOHN R. WILDE, chief engineer of power plants of the Detroit Edison Company, died March 29, of bronchial pneumonia, at his home in Highland Park, Mich. Mr. Wilde was born in September, 1866. After serving an apprenticeship with the Detroit Shipbuilding Company he entered the employ of the Edison Illuminating Company in 1889. In 1892 Mr. Wilde became chief engineer of Willis Avenue, another Edison plant. Mr. Wilde while at Willis Avenue became interested in powdered fuel equipment. His work in this field in 1906 was of a distinctly pioneering nature. He lived to see one of the largest power plants in Michigan, that at Trenton Channel, equipped with this system. In 1931 he was appointed chief engineer of power plants of the Detroit Edison Company. It was this position he occupied at the time of his death.

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DANIEL H. DEYOE of the industrial engineering department of the General Electric Company, a director and member of the American Welding Society and a figure for many years identified in electric arc welding activities, died in Schenectady, April 11, at the age of 55. Mr. Deyoe was a graduate of Union College, class of 1898, and joined the General Electric organization in the same year. He became affiliated with the industrial engineering department in 1906, soon became active in arc-welding problems, and had been an outstanding figure in that field ever since.

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CHARLES S. KNIGHT, JR., sales manager of the electrical wire and wire rope division of the American Steel & Wire Company, Chicago, died March 11, while on a trip in the Southwest. He was born in Worcester, Mass., in 1864, and at the age of fourteen was employed by the Washburn-Moen Manufacturing Company, Worcester, as a weigher and timekeeper. After hard and studious work in this position for a few years he was made a foreman of the mills. Several years later he was placed in the sales department. In 1893 he was appointed manager of sales of the Pittsburgh office, which position he held until 1899, when appointed manager of sales of the entire electrical wire and wire-rope department, with headquarters in Chicago. Mr. Knight was instrumental in bringing about many improvements in wire and wire rope which have been made by his company. He was a member of numerous clubs and associations interested in the improvement and development of electrical wires, cables and wire rope.

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LEONARD CAHOON, Western representative for the Foster Wheeler Corporation of New York, died at his home in Salt Lake City, Utah, April 8, of cancer, at the age of 49. Mr. Cahoon had been prominently identified with the mining and mechanical engineering professions in Utah. Among the organizations with which he had been connected were the United States Smelting & Refining Company, Chief Consolidated Mining Company, International Smelting Company, Galigher Machinery Company and Stratton-Cahoon Company. He was a past-president of the Utah Society of Engineers and also of the Engineering Council of Utah and a past-chairman of the Utah section of the American Society of Mechanical Engineers.

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LAWRENCE W. CODY, district manager at Fort Collins for the Public Service Company of Colorado, died March 8, after an illness extending over more than a year, ending his career as a utility official in the same organization with which he started 25 years ago. A native of Kalamazoo, Mich., he went to Denver from St. Louis, Mo., in 1906, affiliating with the old Denver Gas & Electric Company (now Public Service Company of Colorado). After several years' experience as operator and commercial representative, he became manager of the Poudre Valley Gas Company at Fort Collins, later assuming a similar position at the same place for the Northern Colorado Power Company, which effected a consolidation to form the Western Light & Power Company. This organization was purchased about fourteen years ago by the Cities Service Company and became part of the Public Service Company of Colorado. Mr. Cody, having thus been brought back into the organization that initiated him into the utilities industry, was retained as manager and continued in that capacity until the time of his death.

Financial and Statistical News

EQUIPMENT stocks suffered further heavy selling this week along with the major industrial group. This was accelerated in the case of General Electric by the announcement that the quarterly dividend had not been earned. Ingersoll-Rand sold off 17 points and Worthington Pump 4 points in one session. Westinghouse went through its low for the year and Allis-Chalmers approached its low.

——INDISCRIMINATE SELLING CONTINUED IN THE UTILITIES and many issues approximated the year's low quotations on the lack of tangible signs of business betterment. Stocks reaching or going through the year's lows included Columbia Gas & Electric, American Power & Light, American Gas & Electric, etc. The average of 37 representative holding and operating stocks is down to 66.2, against 65.7 at the beginning of the year, and a high for the year of 74.

——CALL MONEY AGAIN TURNED WEAK after the temporary firmer tone displayed during the past few days. Funds were obtained as low as 1¼ per cent.

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Stock Prices Low on Dividend Basis

THE FOLLOWING INTERESTING COMMENT on current prices of utility and other common stock was made by Col. Leonard P. Ayres, vice-president of the Cleveland Trust Company:

"Prices of high-grade common stocks are now relatively high when considered in relation to the earnings of the companies, but fairly low on the basis of the dividends being paid. If we measure stock prices as multiples of earnings, the interesting fact comes to light that the prices were a good deal higher during most of 1930, and at its close, than they were at the peak of the bull market in 1929. The price-earnings ratios are a good deal higher now than they were a year and a half ago, and this is because earnings have fallen even further and more rapidly than have stock prices."

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Recent Listings

NEW YORK STOCK EXCHANGE has authorized the listing on or after April 1 of not exceeding 4,844 additional shares of common stock of the Federal Light & Traction Company (par value $15 per share) on official notice of issuance as a stock dividend, making the total amount applied for 489,621 shares.

The listing of an additional 344,058 shares of $5 cumulative preferred stock, no par value, of the Public Service Corporation of New Jersey has been authorized by the New York Stock Exchange.

New York Stock Exchange has also authorized the listing of 312,000 additional shares of common stock (par $25) of the Southern California Edison Company, Ltd., on official notice of issuance and payment in full pursuant to offer to stockholders, making the total net amount applied for 3,284,381 shares.

There have also been authorized for listing on the New York Stock Exchange 2,170,666 additional shares of common stock (no par value) of the United Corporation on official notice of issuance in connection with the acquisition of additional shares of common stock of Niagara Hudson Power Corporation.

New York Stock Exchange has authorized the listing of 34,000 additional shares of class A stock of the Utilities Power & Light Corporation (no par value) on official notice of issuance and payment in full by sale to stockholders in lieu of cash dividend, making the total amount applied for 1,829,000 shares.

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Philadelphia Electric Sells $15,000,000 Preferred Stock

AS A RESULT OF THE recent customer-employee stock offer, Philadelphia Electric Company will issue 150,000 shares of its $5 preferred stock at $100 per share. The offer, as announced in the April 4 issue of the ELECTRICAL WORLD, originally consisted of 50,000 shares, but the response was so great that the issue was heavily oversubscribed and the company, in order not to disappoint customer and employee subscribers, increased the amount of stock to be issued to 150,000 shares. The proceeds will provide for the financial requirements of the company for 1931. The stock was offered at $100 per share upon a cash basis, or on an installment plan calling for $10 down and $10 per share per month for nine months.

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Niagara Hudson Issues Annual Report

GENERATING capacity of Niagara Hudson System totals more than 1,570,000 kw. (approximately 2,100,000 hp.), according to the annual report of the corporation, recently issued. The generating capacity of the system was increased 227,000 kw. during the year 1930 and service facilities were considerably expanded through the $49,000,000 construction program carried out. Sales of electricity by the system totaled 6,131,679,245 kw.-hr., the decrease of 5.9 per cent from the sales of 1929 being due to industrial quietness, for sales to rural, commercial and residential customers increased substantially.

The extensive construction program carried on during 1930 is also reviewed by the report. More than $49,000,000 was spent in extending and improving service facilities, keeping about 7,000 extra men employed. It is also stated that an additional $34,000,000 will be spent during 1931 to carry the work further.

Stockholders at the end of 1930 numbered 88,437 in the parent company alone, an increase of 8,000 during the year. The report says that approximately 62 per cent of the corporation's stockholders live in New York State, and every state in the United States and fourteen foreign countries are also represented in the list. Electric customers of system companies increased 13,648 during the year and on December 31, 1930, totaled 648,679. The average use of service per residential customer rose from 591 kw.-hr. in 1929 to 631 kw.-hr. in 1930. This brought a decrease in the average rate paid by these customers, the 1930 figure being 4.8 cents per kilowatt-hour.

Net earnings were $15,558,345 in 1930, compared to $15,588,539 in 1929. This is equivalent to 60 cents per share on the common stock of the corporation in 1930 against 61 cents per share in 1929. Taxes paid by the system during the year amounted to $10,070,063.

Speaking of the business situation, the report says: "The present business depression has emphasized the importance of the public utilities as agencies for providing steady employment for great numbers of our people and for supporting our local, state and national government by taxes. About 65 per cent of the total spent yearly by these companies is paid out in wages to produce copper, aluminum, steel and other metals, to manufacture the delicate and highly specialized machinery to generate the electrical energy which the public utilities sell, also to build transmission lines, towers and cables and to provide the innumerable special things necessary to bring this service to its ultimate consumer."

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Hulswit Returns to United Light Directorate

FRANK T. HULSWIT has returned to the United Light & Power board. Five years ago he resigned as president of the company at the time that Otis & Company, bankers, became actively interested. His reappointment is interpreted as indicating the settlement of any differences that may have existed between board members at that time.

Mr. Hulswit's return to the board is to represent 105,950 class B common shares of the company held by American Commonwealth Power Corporation, which company Mr. Hulswit organized and developed since he severed his connection with United Light & Power. This block represents approximately 10 per cent of the voting strength of United Light & Power Company.

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Associated Electric Issue

A THIRTY-TWO-MILLION-DOLLAR issue, the greater portion of which has been placed privately, was offered by the Associated Electric Company in the form of 5 per cent gold bonds, priced at 97½ and interest, to yield more than 5.16 per cent. This issue does not represent new financing by the company at this time, these bonds originally having been acquired by Associated Gas & Electric Company. The greater portion is now privately held by interests not identified with the company and the balance, amounting to $5,500,000, has been offered for sale. These bonds are issued to provide for the senior financial requirements of the utility properties which the Associated Electric Company operates.

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February Revenue Down 2 per Cent

APPARENTLY reflecting the effect of an 8.2 per cent recession in this year's January energy output compared with last year's, the February revenue of electric light and power companies throughout the United States shows a corresponding decline of nearly 2 per cent. For the fourth consecutive month the income has failed to reach the figures of the preceding year, though the difference has been relatively small. The earnings are above those of 1929 and all earlier years, the February revenue being, in 1928, $163,800,000; in 1929, $176,800,000; in 1930, $185,800,000; in 1931, $182,280,000.

The decrease from January of 7.5 per cent is accounted for by the difference in the lengths of the two months; eliminating this effect by comparing average daily earnings, the latter figure, close to $6,500,000, is seen to be larger than the $6,370,000 of January. But the rise is less than usual, 2 per cent instead of the normal 3.5 per cent.

Operating and maintenance expenses, estimated at $75,650,000, exclusive of such items as taxes, and allowance for sinking funds, are down in about the same ratio as revenue; consequently the net shows a small decrease.

Energy output, 6,730,514,000 kw.-hr., also was less than last year, but compared with January there seems to have been a slight improvement, February being short only 6 per cent, against 8 per cent in January. Despite the decrease, more energy had to be generated than last year from fuel, water-power production again falling short by fully 20 per cent, as it did in January, and accounting for only 30.5 per cent of the total.

It is noteworthy that the consumption

Contrasts, East and West, in Upper Mississippi Valley

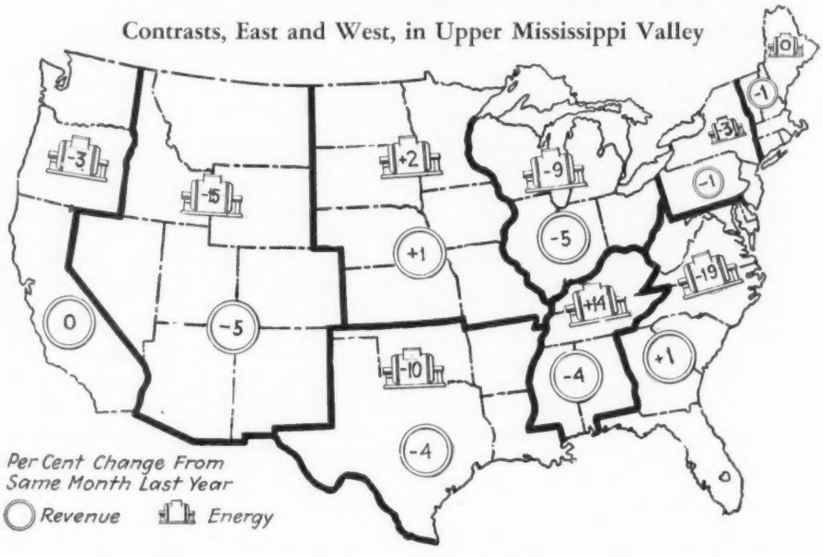


Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

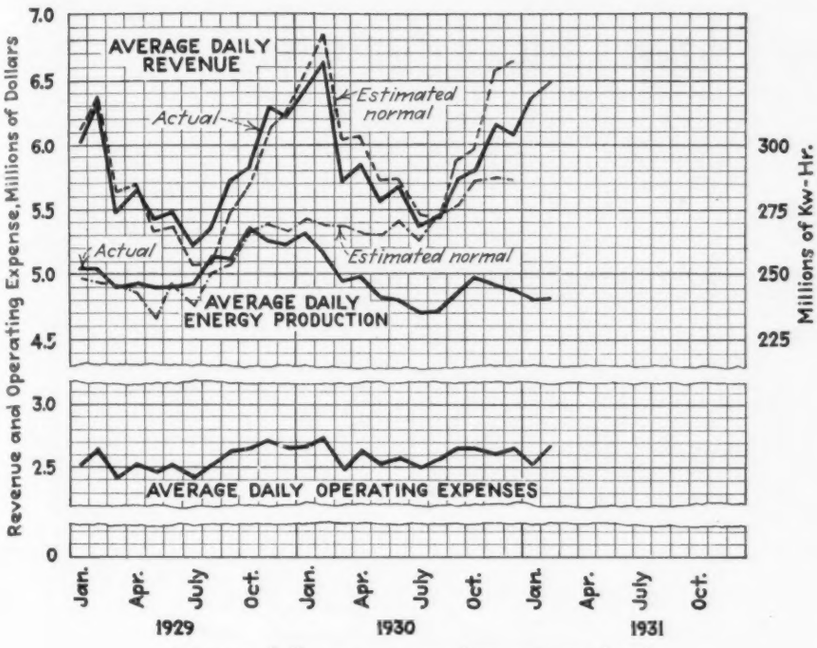
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1930 Thousands	1929 Thousands	Per Cent Inc.	1930 Thousands	1929 Thousands	Per Cent Inc.
November	$187,340	$190,200	—1.5	$78,840	$80,930	—2.6
December	191,920	192,200	—0.1	82,520	82,680	—0.2
	1931	1930		1931	1930	
January	197,160	198,300	—0.6	79,310	81,480	—2.7
February	182,280	185,800	—1.9	75,650	77,300	—2.1

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1930	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
November	3,414,847	—2.2	764,893	—33.2	9,721,474	—15.4
December	3,549,648	—4.3	820,002	—23.8	10,089,914	+1.0
1931						
January	3,393,185	—7.9	772,783	—27.8	9,968,910	+1.6
February	3,001,383	—4.1	623,422	—7.8	9,073,862	—1.2

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey



Average daily output near low summer level

of each principal kind of fuel was less than it was a year ago, though more kilowatt-hours were producted from it. The quantities, according to data collected by the U. S. Geological Survey, are given in Table II. Purchase of energy for resale continues to increase at an average rate not far from 10 per cent annually, and so is rapidly rising in ratio to the amount generated. This increase and the transfers between systems implied in much wider fluctuations in regional than in national output are closely connected with the progressive reduction in fuel consumed per kilowatt-hour output.

Regionally, as to revenue, Table IV shows losses from last year with only two exceptions: Small gains are reported in the South Atlantic States and the agricultural Northwest. Each of the three major industrial regions is down; the changes from January are too slight to warrant definite conclusions. In the Western group the January gains have disappeared, operations being somewhat below the 1930 level.

In regional energy output the changes from last year are far greater than can be accounted for by fluctuations in local demand; comparison of the differences between hydro and fuel output indicates large-scale transfers to meet deficiencies in the former.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1930	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
November	7,227,716	— 6.9	2,010,620	—18.3	5,217,096	— 1.6	2,050,000	+ 9.1
December	7,605,855	— 4.9	2,186,070	—15.4	5,419,785	— 0.1	1,989,000	+ 7.5
1931								
January	7,485,374	— 8.2	2,220,254	—20.4	5,265,120	— 1.8	1,995,000	+12.5
February	6,730,514	— 6.2	2,053,402	—20.5	4,677,112	+ 1.8	1,798,000	+10.0

Table IV—Regional Operations, Revenue and Energy Output in February, 1931

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	182,280	— 1.9	6,730,514	— 6.2	2,053,402	—20.5	4,677,112	+ 1.8
New England	18,480	— 1.2	469,398	0	116,569	—31.2	352,829	+17.9
Middle Atlantic	49,560	— 1.0	1,705,522	— 3.1	336,849	—32.4	1,368,673	+ 7.5
East North Central	43,940	— 4.8	1,615,791	— 8.5	112,440	—33.7	1,503,351	— 5.9
West North Central	15,270	+ 0.8	436,911	+ 2.2	89,256	— 8.6	347,655	+ 5.4
South Atlantic	19,800	+ 0.8	771,235	—18.9	353,371	—37.4	417,864	+ 7.8
East South Central	5,880	— 3.8	311,109	+14.2	262,412	+21.6	48,697	—13.9
West South Central	9,040	— 4.1	338,686	—10.4	6,484	—27.8	332,202	— 9.9
Mountain	4,500	— 5.2	225,501	—14.7	163,714	—24.4	61,787	+29.1
Pacific	15,810	— 0.1	856,361	— 3.4	612,307	— 6.1	244,054	+ 3.6

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station operations.

Insull Defends Present System of Regulation

REGULATION OF THE operating company, with freedom of the electric light and power holding investment company, is to the best interests of the public, Martin J. Insull, president of the Middle West Utilities Company, declared in a talk last night. He pointed out that the public is thus protected against monopoly, and has the advantage of the initiative and enterprise that financially strong private business brings.

In the course of his talk Mr. Insull traced the development of the investment holding company, showing that it was a necessary step in the upbuilding of America's electric power industry today. He also showed that it was not a new idea in America's industrial history, nor has it been confined to the electric light and power industry, and as examples of other holding companies cited General Motors, United States Steel Company and American Telephone & Telegraph Company.

It is the initiative and enterprise of the holding investment companies during the past twenty years that has made the electrical industry in America preeminent in the whole world, Mr. Insull declared, and, going on said:

"As shown by the statistics, it has provided ample generating capacity; it has taken the advantages of electric energy to the small towns, hamlets and farms. Its transmission and distribution lines cover the country so that industry is assured of ample power in practically any locality. It has given to our homes a constantly increasing service at continuously reducing rates until electricity has become one of our outstanding necessities at a cost to us of only a few cents per day. It has made electric light and power securities so popular with the investors that they have provided the money to make these things possible and will continue to do so in the future so long as they feel assured of fair treatment by government of their investments.

"These things have been accomplished by the holding investment company organizations of the electric power industry. These organizations, therefore, should continue in the future with the same freedom of action they have had in the past so that the day will come when every nook and corner of the land will have available 'cheap electric power anywhere and everywhere.'"

Business News and Markets

W. S. Gifford Sees Signs of Business Improvement

THERE are definite signs of business improvement on the horizon, Walter S. Gifford, president of the American Telephone & Telegraph Company, told the Associated Press at its annual luncheon at the Hotel Commodore, New York, this week. "I want to reaffirm my faith in the continued progress of our country, in the common sense and ability of its people—in short, I want to reaffirm my faith in American democracy—political, social and economic, and to add that the experiences of this depression have done more to confirm this faith than the experiences of the boom that preceded it," said Mr. Gifford. He continued:

"I have tried to make clear my belief in a few simple propositions:

1. That the path of progress is an evolution from our present situation.
2. That the democratic method followed in America not only provides abler and more effective though less spectacular leadership than any other, but also far more ability for attainment among the public generally.
3. That democracy provides a far higher economic, social and spiritual objective than any other form of society.

"I believe in the common sense and ability of the American people and I have, therefore, no fears of the present or the future. The immediate present, the statisticians of the telephone company tell me, shows signs of improvement. How fast that improvement will be measured in weeks or months I don't know. But in the telephone company we have every confidence in the future—not only confidence, but the keenest interest in the possibilities ahead of us.

"Industrial democracy has given this generation the tools to accomplish great things for humanity. We are living in a time of great opportunity, of stimulating appeal to the imagination. The mastery of depression is one of the challenges ahead of us. Let us continue to attack it. Every day in the papers we read of some action taken, of this plan or that program, for the press is the medium for the interchange of ideas. Every week, at least, some one comes forward with a program and the desire to start an association to further it. You go nowhere where the subject is not discussed. This process is going on with thousands and thousands of people in every part of this country. Out of it we shall get an answer—we shall get plans for progress perhaps never clearly defined but plans that take account of the needs of the many, that have been tested from every angle, and that have behind them the power of the Amercian people, and plans that are likely to be in effective operation before any one has time to make a good description of them."

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American Brown Boveri Shows Smaller Earnings

OPERATIONS OF THE American Brown Boveri Electric Corporation and subsidiaries for the year ended December 31, 1930, resulted in considerably lower net profits than for the previous year. The balance after bond interest, discount, federal taxes, etc., amounted to $1,527, in comparison with $402,436 in 1929.

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Standards for Panel and Distribution Boards

THOSE WHO SPECIFY OR ORDER electrical wiring materials will be interested in the new pamphlet of standards for panelboards and distribution boards issued by the National Electrical Manufacturers' Association. This pamphlet shows design and construction features which years of experience and research have indicated to be satisfactory mechanically and electrically from the standpoint of safety and service. It was prepared by the panelboard and distribution board section of the association, whose members have produced a large majority of all such equipment since 1918.

In purchasing panelboards for use under ordinary conditions, the section members explain, considerable economies may be realized through proper selection of stock equipment embodying the standard designs. For unusual conditions, though a stock design properly applied may be entirely satisfactory, the suppliers of the equipment should be consulted in order to avoid difficulties arising from incorrect application.

In this respect particular attention should be given to the capacity of the main busbars or panelboards. The stock designs are based on a reasonable load factor, and if the lighting arrangement indicates that a large number of the circuits on a panelboard will be turned on at one time the manufacturer should be so informed.

A valuable new section of the pamphlet contains a list of definitions of various terms used in connection with panelboards and distribution boards. These have been made to correspond closely with the definitions of the Association of Electragists, International.

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Why Is the Radio Industry in the Red?

OUT OF 155 FIRMS in the radio set manufacturing field only a very few made any profit on their radio business last year, according to a study made recently by *Electronics*. Radio men attribute this to such factors as:

1. The general economic depression.
2. Overproduction of radio sets.
3. The licensing situation, patents, etc.
4. The coming of "the midget idea."
5. Inadequacy of distribution machinery.
6. Public apathy toward broadcasting.
7. The approach of receiver saturation.

As a solution for the difficulties in which the industry finds itself, *Electronics* suggests a number of remedies which may be summarized as follows:

Statistical control of production.

More uniform factory production throughout year.

Purchase of ready-made parts where economic.

Diversification of production outside radio.

Price schedules that compensate all factors in the merchandising chain.

Opening up new territories by increase of broadcast power and "synchronizing."

Promotion of public appreciation for broadcasting.

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TRADE BRIEFS

The new Eastern address of the Inca manufacturing division of the National Electric Products Corporation is the Woolworth Building, 233 Broadway, New York.

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W. N. Matthews Corporation announces that it has paid its 31st consecutive quarterly preferred stock dividend of $1.75 per share to stockholders.

•

Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Stable-Arc" welders and "Linc-Weld" motors, announces the removal of its Chicago office to a new building at 1455 West 37th

Street, from 53 West Jackson Boulevard.

•

Walter H. Wiewel has been made sales manager of the Timken Steel & Tube Company, Canton, Ohio.

•

Consolidated Wire and associated corporations announce that they have moved their offices, factory and warehouse from Green and Congress Streets to Peoria and Harrison Streets, Chicago.

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General Electric Common Earned 38 Cents

ORDERS RECEIVED BY THE General Electric Company for the first quarter of 1931 amounted to $60,366,297, compared with $90,397,731 for the corresponding three months of last year, Gerard Swope, president of the company, announced at the annual meeting of stockholders. This is a decline of 33.2 per cent.

Sales billed for the first three months of 1931 amounted to $61,959,800, compared with $91,205,732 for the corresponding period last year, a 32 per cent drop.

Profit available for dividends on common stock for the first quarter of 1931 was $10,844,334, compared with $14,398,790 for the same three months last year, which is equivalent to 38 cents per share in 1931 and 50 cents per share in 1930 on the 28,845,927 shares outstanding in both periods. The quarterly dividend is 40 cents a share.

Comparative statement of sales and earnings for the three months follows:

	1931	1930
Net sales billed	$61,959,800	$91,205,732
Less: Cost of sales billed, including operating, maintenance and depreciation charges, reserves and provision for all taxes	53,755,239	80,590,320
Net income from sales	8,204,561	10,615,411
Other income, less interest paid and sundry charges	3,283,520	4,427,110
Profit available for dividends	$11,488,082	$15,042,521
Less: Cash dividends on special stock	643,747	643,731
Profit available for dividends on common stock	$10,844,334	$14,398,790

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Westinghouse Orders Down 36 per Cent

ORDERS RECEIVED BY Westinghouse Electric & Manufacturing Company during the first quarter were $30,100,410, against $47,150,196 for the first quarter 1930, a drop of over 36 per cent. Net sales billed were $27,837,160, against $45,043,934, a 38.2 per cent decline. A deficit of $2,885,945 was shown in net income against a surplus of $4,546,618 last year's first quarter.

At this time prospects for the future are somewhat brighter for two reasons: (1) The economies and reductions in expenses which are being put into effect daily will have cumulative effect on future operations; (2) since January, orders booked have substantially increased, though still at a rate considerably under normal. February and March were progressively better and it is expected that final figures for April will show the improvement being maintained.

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Electrical Manufacturing Declines

SLOWER operations than during any other month in 2½ years are indicated by March returns from electrical manufacturing plants. These returns, made each month to the ELECTRICAL WORLD, give the energy consumption, which serves as a measure of industrial activity.

The last preceding low point was in December, with the computed index

Comparative Index Numbers

March, 1931	124.3
February, 1931	149.0
January, 1931	144.7
December, 1930	132.4
March, 1930	153.0
February, 1930	165.2
Average first quarter, 1931	139.3
Average first quarter, 1930	158.1

at 132.4; the March index, 124.3, represents a decline of 6 per cent from that month's operations, and makes the intervening rise in the curve, for January and February, take on the aspect of an episode in the downward movement which has been going on somewhat irregularly, though persistently, since the peak month of October, 1929. The index for that month was 180.6; the decrease since that time is equivalent to 31 per cent. The new level is 19 per cent below that of March, 1930, but at that time electrical manufacturing was still at the plateau of its curve. The decline is greater than in the general index for all industrial activity; the latter is only 10 per cent lower than a year ago. But comparison with early 1929 gives a different result. At that time this particular industry had attained its highest level. Against March, 1929, electrical manufacturing is down 17 per cent; all industry 20 per cent.

Examination of individual returns shows much uniformity in the decrease; while a few reports indicate greater activity than in the early winter, these are outweighed by the movement in the opposite direction. Some of the larger, however, have approximately maintained a constant level during the past three or four months.

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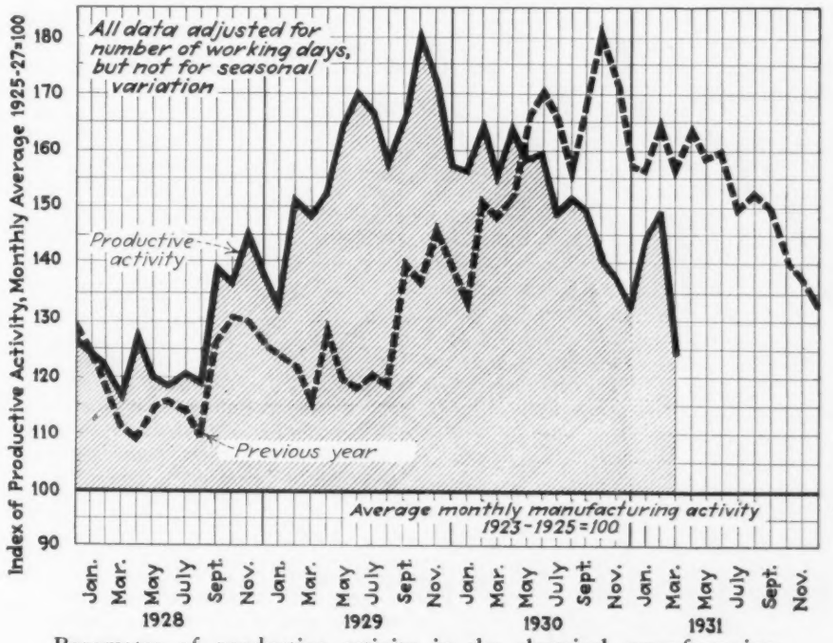
New York Metal Prices

	April 15, 1931 Cents per Pound	April 22, 1931 Cents per Pound
Copper, electrolytic	9¼	9¼
Lead, Am. S. & R. price	4½	4.50
Antimony	6.90	6.85
Nickel, ingot	35	35
Zinc, spots	4.10	3.90
Tin, Straits	25½	24.80
Aluminum, 99 per cent.	23.30	23.30



Barometer of productive activity in the electrical manufacturing plants of the United States

Market Conditions

LONG pull rather than immediate improvement now seems to be stressed on the Pacific Coast as earlier active buying slackens down somewhat. A number of sizable orders are reported. Middle and Southwest business also record slackening tendencies during the past two weeks.

——A TAPERING OFF OF ORDERS IS RECORDED also in the Eastern district, but inquiries are encouraging. Electrification programs are being actively promoted.

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PACIFIC COAST

—NEW YEAR OPTIMISM *has been replaced by sturdy determination to dig in for a long fight for prosperity, justified by a very gradual betterment of conditions. Orders are still largely placed for one step above minimum quantities and prices on such staples as rubber-covered wire and boxes have sharply dropped, though wiring supplies still hold firm. Wholesalers report slightly increased sales, decreased overstock and fairly prompt collections.*

—POWER BUSINESS IS FAIR; *railroad inquiries are better, but still cut below normal requirements. Contractors' business is improving steadily, though still hurt by the multiplication of new firms, while state and municipal business ranks with government business as headliner.*

Industrial business is still poor, except among packing plants and other firms which are being overhauled for seasonal crops. The counties relying on grain crops will be hard hit by drought conditions. Last week's business is featured by street lighting activity, including a $25,000 sale of Westinghouse standards, tops and transformers in Los Angeles, a 75-top $9,500 award in San Francisco, a new system for Reno and additions for San Francisco, Palo Alto and Mount Shasta City. Other features include chain business for six motor inns averaging $175,000 each and seven theaters, while further chains are planned for other districts. Hoover Dam purchasing will soon be brisk, though still largely in the formative and unstandardized stage. Major construction prospects include a $2,000,000 bond issue for new Oakland buildings, a $4,000,000 appropriation for various small federal buildings throughout the state and considerable government activity in barracks and hospital additions for San Francisco reservations. The outstanding machinery order of the week covers a $19,000 assortment of General Electric motors, sizes 10 to 150 hp., for an East Bay linoleum plant.

Bids for the Pennsylvania Transfer Company for furnishing transformers and reactors for Seattle Lighting Department involving $48,273 were accepted by Board of Public Works, on April 17. A contract was awarded for 78 distribution transformers to W. R. Hendry Company for $7,666 and bids were opened for 34 automatic induction regulators. Motor sales showed marked improvement last week, one jobber reporting a movement of 50 motors from 150 hp. down to pulp and paper mills, lumber manufacturing plants and canneries; another, ten machines to a Gray's Harbor sawmill; another, 30 machines from 50 hp. down to irrigation and orchards, and another, 100 machines from 50 hp. down to mills, industrial plants, dealers and miscellaneous sources. Bureau of Yards and Docks, Washington, D. C., is taking bids until June 3 for one 250-ton stationary hammerhead crane, electrically operated; 20-ton traveling tower crane, gasoline-electric operated, and one 10-ton gasoline-electric-operated traveling gantry crane. Seattle Board of Public Works opened bids April 24 for 6,000 ft. of rubber-insulated, lead-covered cable and for 17,500 ft. of 6,000-volt stranded copper wire. Plans are being formulated for lighting business in the district of Snohomish.

CONSTRUCTION PROJECTS

Signal Officer, United States Signal Corps, Presidio, San Francisco, Calif., is asking bids until May 6 for installation of a submarine cable between San Francisco and Bakers Beach, Fort Winfield Scott, Calif. (Circular 5). Orange Mutual Citrus Association, Orange, Calif., plans electric-operated precooling plant to cost $85,000. Barde Steel Company, Seattle, Wash., contemplates branch plant at Spokane, Wash., to cost over $125,000. State Board of Education, Helena, Mont., plans state industrial school at Miles City, Mont., to cost $90,000. Utah Power & Light Company, Salt Lake City, Utah, has secured permission to construct and operate steam-electric generating plant on Utah Lake.

SOUTHWEST

—THERE HAS BEEN *a fair demand for medium sizes of apparatus during the past week. Manufacturers say that business to date has been about equal to that of the same period last year.*

One significant feature has been the careful buying by utilities. The only contracts reported closed are for generators and motors for an electrically operated government dredge boat costing $19,000, and a lot of distribution transformers for a power company in southwest Missouri, $2,000.

CONSTRUCTION PROJECTS

Wabash Railroad Company, St. Louis, Mo., plans addition to grain elevator at North Kansas City, Mo., to cost over $250,000. Norris Grain Company, Kansas City, Mo., plans addition to grain elevator to cost $280,000 with electric and other equipment. University of Arkansas, Little Rock, Ark., plans science building at institution at Fayetteville, to cost over $200,000. Simms Oil Company, Dallas, Tex., contemplates extensions in oil refining plant near city in connection with proposed pipe line installation, entire project to cost $1,000,000.

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SOUTHEAST

—BUSINESS IN THE *Southeast may be said to be holding its own. No unusual activities in the central station or industrial field are to be noted at this time.*

One of the larger power companies ordered last week three 1,250-kva. transformers and $3,000 worth of distribution transformers. Some other central station orders were for $5,400 worth of metering equipment, $3,910 worth of clamps and $1,665 worth of creosoted pine poles. In connection with a textile mill electrification job in Georgia there was let this week a $14,000 wiring contract and purchase orders for $2,500 worth of fire pump equipment and $1,000 worth of short center drive. Another mill in the same state ordered last week $4,000 in motors. There is in prospect for the next couple of weeks an order for feeder regulators for a Mississippi power company which will cost in the neighborhood of $9,000. An independent telephone company in West Florida ordered one car of telephone wire this week.

CONSTRUCTION PROJECTS

Appalachian Electric Power Company, Charleston, W. Va., plans transmission line to Swords Creek, Va., and vicinity for power service. Southern Power Company, Charlotte, N. C., plans construction of transmission line from power plant on Dan River to Walnut Grove, N. C., and vicinity, to cost over $30,000. Period

Furniture Company, High Point, N. C., plans plant to cost close to $40,000. Hamilton-Carhartt Company, Detroit, Mich., contemplates work-clothes manufacturing plant at Irvine, Ky., to cost close to $100,000.

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EASTERN

—CONTRACTS FOR ELECTRICAL *equipment show signs of tapering off in the Eastern district and the past week has developed a noticeable decline in actual commitments. The lull in buying seems temporary, as inquiries are holding at an encouraging rate and indicate definite immediate needs for central station programs and industrial operations.*

—MUNICIPAL POWER PROJECTS *offer some good early prospects both for prime movers and other equipment. Government call for electrical apparatus and supplies is gaining strength and there is some close bidding on impending awards. Airport lighting and floodlighting equipment show an improved tone and volume for spring account.*

Pennsylvania Railroad is pushing its electrification program on section of line between Manhattan Transfer and Trenton, N. J., and is expected to make additional purchases of equipment for this development, as well as for like work between Wilmington, Del., and Washington, D. C. All awards for structural steel for towers have been placed, being divided among seven steel fabricators for a total of more than 100,000 tons. The Minneapolis & St. Louis Railway has placed an order with the St. Louis Car Company for four gas-electric rail motor cars. Ten manufacturers have submitted figures to the General Purchasing Officer, Panama Canal, Washington, for three transformers for canal zone, and order will soon be placed at approximately $9,000; nine makers have tendered quotations to the same office for heavy disconnecting switches.

Radio broadcasting stations are offering an expanding market for equipment and business in this line for the first quarter of the year exceeds considerably the total for any similar period in 1930. Spring account gives equal promise for transformers and other power apparatus, antenna materials, steel towers, etc. A New York electric company is furnishing complete equipment for a new broadcasting station in Oregon, with steel tower units going to a Pennsylvania fabricator. Demand for industrial equipment is spotty; iron and steel account for heavy mill motors, controls and auxiliary apparatus is fair, with outlook showing improved tone.

A manufacturer of electric recording meters reports a marked improvement in orders and several plant departments have been placed on a full time basis following a curtailed schedule for several months. A maker of fire alarm and signal equipment is stepping up production and has secured sufficient orders to insure close to normal production until summer. A manufacturer of domestic electric appliances has resumed production following a three months' shut down and will employ over 2,000 workers.

CONSTRUCTION PROJECTS

Signal Supply Officer, Army Base, Brooklyn, N. Y., will receive bids until May 8 for ammeters, lamp assemblies, transformers, resistors, fuses and other electrical supplies (Circular 139). Superintendent of Lighthouses, Staten Island, N. Y., will receive bids until April 30 for one Diesel propelling engine and two auxiliary compressors (Schedule 36438). Bureau of Repairs and Supplies, Fire Department, New York, contemplates centralized fire department instruction school, repair shops and training camp in Brooklyn, to cost over $2,000,000. Buffalo General Electric Company, Buffalo, N. Y., will build a power substation on East Delavan Street. Niagara Paper Mills, Lockport, N. Y., plan expansion and improvement program at mills at Latrobe, Pa., to cost about $80,000. Gulf Refining Company, Pittsburgh, Pa., will build addition to oil storage and distributing plant at Cleveland, Ohio, to cost $175,000, and plans loading and distributing plant on waterfront at Newport, Ky., to cost over $90,000. United States Engineer Office, Pittsburgh, Pa., will receive bids until May 5 for lock-operating machinery for new Lock No. 4, Monongahela River (Circular 640). Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until May 5 for 128 electric motors for Brooklyn Navy Yard (Schedule 5583); also, at same time for same yard, for 50 electric air compressors (Schedule 5508).

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NEW ENGLAND

—SALES OF SMALL MOTORS *are of outstanding interest in the electrical market and lead in importance. Negotiations for heavy machinery are advancing more vigorously, according to one manufacturer, with interest in turbo-generators increasing and attention to power generating units noted.*

Recent sales of motors reported include an order for about 100 40-hp. motors for pumping units. In addition a 300-hp. generator for an eastern Massachusetts location is being considered and will be ordered soon. Spotty buying of fractional-horsepower motors is reported by one manufacturer. Central station supplies are uneven; interest in industrial electric furnaces is more active and sales of electric ranges are advancing. Orders amounting to over 1,140 electric ranges were received as of April 1 by one group of central stations. An order of four carloads of ranges was recently placed by one company. Water heaters are receiving more attention.

CONSTRUCTION PROJECTS

Worcester, Mass., has plans for a municipal multi-story mechanical and service shop to cost about $130,000. Connecticut School for Boys, Meriden, Conn., will have plans drawn for group of buildings, including a vocational training shop, to cost over $600,000. Bethwood Research Laboratories, Inc., Bethany, Conn., plans laboratory unit to cost about $40,000.

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MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section continues to mark time. The volume of business decreased slightly and the prospects for immediate improvement appear quite remote.*

—MAJOR ACTIVITIES *are maintaining their positions with difficulty and it would appear that a continuance of the present rate of activity is all that can be looked for this month. The underlying spirit seems quite cheerful, with a determination to make the best of it.*

A concerted effort to stimulate activity is being made. This effort, in the last week, has resulted in a 22 per cent increase in retail automobile sales in the Chicago area, which in itself is encouraging. It is hoped that the mild spring weather will have a stimulating effect upon construction work and retail department store sales. The various utility companies are proceeding normally, buying conservatively for their immediate needs. Some of the interesting items placed this week include 100 10-kva., 50 50-kva. and 50 75-kva., single-phase, outdoor type distribution transformers, foundation and concrete framing for 12-kv. distributing center to cost approximately $80,000 and "Mazda" lamps valued at $150,000.

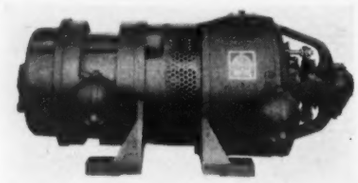
CONSTRUCTION PROJECTS

Consumers Power Company, Jackson, Mich., has plans under way for a control station and other units at Croton Dam, Muskegon River, to cost over $60,000. A. W. Wells Lumber Company, Menominee, Mich., contemplates improvements in saw mills and hardwood lumber plant to cost over $100,000. Petrolagar Laboratories, Inc., Chicago, Ill., has plans for chemical plant at Niles Center, Ill., to cost $225,000. Purdue University, Lafayette, Ind., will take bids for addition to power plant at institution to cost $100,000. Arthur G. McKee & Company, Cleveland, Ohio, engineers, will construct an oil refining plant at Misburg, Germany, to cost $1,000,000. Machined Steel Casting Company, Alliance, Ohio, plans electrification of portion of plant in connection with expansion program to cost $60,000. Minnesota Valley Canning Company, Le Sueur, Minn., plans plant at Windsor, Ont., to cost over $85,000.

New Equipment Available

One-Unit Motor-Generator for Ratings of 1 to 5 Kw.

A ONE-UNIT MOTOR-GENERATOR SET for ratings of 1 to 5 kw. has been developed by the Reliance Electric & Engineering Company, Cleveland, Ohio. In these sets the usual alternating-current motor and direct-current generator are combined into a single unit, requiring only two bearings, one at each end. The



induction-motor rotor and direct-current armature are mounted on the same shaft.

This design provides a very rugged, compact construction, it is claimed, which requires less space than with the two-unit sets. Because it is one unit the work of connecting and aligning individual units and attendant troubles are eliminated. The conduit outlets are large, to facilitate wiring.

These motor-generator sets can be furnished for operation on either two- or three-phase circuits of any standard voltage or frequency and have an output rating of 1 to 5 kw. at 125 or 250 volts. They may be obtained with either sleeve or ball bearings.

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Four-Element Oscillograph for Automatic Recording

THE TYPE PA OSCILLOGRAPH, designed to keep pace with the development and application of high-speed protective equipment for power systems, has been announced by the Westinghouse Electric & Manufacturing Company. This instrument combines the basic features of earlier oscillograph models with the addition of quick automatic operation. While it is primarily arranged for recording chance disturbances, it can be adapted for staged tests as well.

The complete instrument operates on a 6-volt battery and a magnetic clutch and magnetic shutter are used.

For automatic operation it is driven by a motor direct connected to the film holder through a gear reduction unit having two ratios. With 6 volts on the field and armature, film speeds of 5 and 10 in. per second may be obtained. For quick automatic operation a magnetic clutch is available and is installed directly on the motor shaft.

Means of putting the oscillograph into operation after the appearance of a fault on a power system is provided. It energizes the oscillograph lamps and the motor on the film holder for the simplified outfits and also energizes the mangetic clutch and shutter in the high-speed outfit.

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A NEWLY DESIGNED COMBINATION OF ELECTRIC HEATER AND FAN has been announced by Hoffman Specialty Company of California, Ltd. The heat-fan provides comfort wherever and whenever safe, healthful, quick warmth is needed. Although light in weight and compactly designed, it is ruggedly constructed to insure a long life of usefulness. The effectiveness of the "Thermador" principle of electrical heating is centered in the dependability and endurance of the quality built motor and the simplicity of control. The fan speed for heater duty is automatically regulated, providing for the required increase in speed when only cooling and air circulation are desired in warm weather.

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Flexible Armored Weatherproof Cable

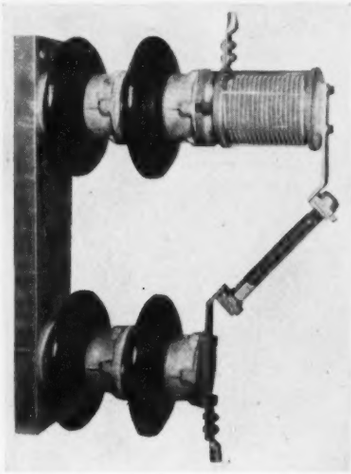
A CONSIDERABLE REDUCTION in the cost of service entrance is claimed through the use of a new flexible armored weatherproof cable announced by the General Cable Corporation. The new cable is designed to take the place of individual wires and rigid conduit formerly used from the point of attachment of the aerial conductors on the building to the service-entrance switch.

The cable, structurally, is a combination of several features of "Trenchlay" (non-metallic underground cable), parkway and aerial cables. Three rubber-covered and braided wires are cabled and sealed against moisture by an asbestos base calk. A braid over all three of the conductors is saturated with a special compound. An interlocking

galvanized steel tape armor is then applied to give the necessary mechanical strength, and another treatment of calk protects this armor from moisture.

Outdoor Fuse Mounting with Limiting Resistance

A NEW LINE OF single-pole, high-voltage, outdoor, 15-amp. fuse units for service transformer protection has been announced by the Delta-Star Electric Company, Chicago, Ill. The limiting resistance, in series with the fuse contact, is inclosed in a heavy glass container and mounted on the upper in-



sulator unit. This permits the S & C fuse to be mounted at an angle permitting easy insertion or replacement by means of insulated fuse tongs. This unit for 15-kv. service has a dry flashover value of 140 kv. and wet of 80 kv. at 60 cycles.

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Slip Switch for Braking A.C. Motors

AN IMPROVED DESIGN of its slip switch for braking a.c. motors is announced by the Monitor Controller Company, Baltimore, Md. The new switch is completely inclosed and arranged for rigid or flexible conduit connection.

For reverse-torque of plug reverse braking of a.c. motors, where the slightest motor reversal is neither desirable nor permissible, Monitor offers its "Lotrip" switch. This switch automatically disconnects the motor from the line just before it comes to rest. The same switch can be used for braking in either direction or in both directions by changing the switch arms.